83-4463/

COVER PHOTOGRAPH shows one of the advanced self-fruitful sweet cherry selections from the Horticultural Research Institute of Ontario's breeding programme.

REPORT OF THE AGRICULTURAL RESEARCH INSTITUTE OF ONTARIO

Toronto, Ontario
March 31, 1984

Dr. D.C. Wilson, Chairman
Agricultural Research Institute of Ontario

Dear Sir:

I submit herewith a report of the Ontario Ministry of Agriculture and Food's research programmes in agriculture, veterinary medicine, and household science for the year ending March 31, 1984.

Respectfully submitted,

J.C. Rennie
Director of Research
Agricultural Research Institute
of Ontario

Mississauga, Ontario
April 1, 1984

The Honourable Dennis R. Timbrell
Minister of Agriculture and Food
Legislative Buildings
Toronto, Ontario M7A 1A3

Dear Sir:

I have the honour to submit the twenty second research *Report of the Agricultural Research Institute of Ontario* for the period April 1, 1983 to March 31, 1984.

The Institute wishes to express its sincere appreciation for the wholehearted cooperation of the administration and staff of the institutions at Centralia, Guelph, Kemptville, New Liskeard, Ridgetown, Toronto, and Vineland in the planning and execution of research programmes in agriculture, veterinary medicine, and household science.

Respectfully submitted,

Donald C Wilson

D.C. Wilson
Chairman
Agricultural Research Institute
of Ontario

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Economics Branch — EC
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Vineland Station, Ontario L0R 2E0

Kemptville College of Agricultural Technology — KCAT
Kemptville, Ontario K0G 1J0

New Liskeard College of Agricultural Technology — NLCAT
New Liskeard, Ontario P0J 1P0

Ridgetown College of Agricultural Technology — RCAT
Ridgetown, Ontario N0P 2C0

University of Guelph — UG
Guelph, Ontario N1G 2W1

BUDGET

Allocation of Funds for Research 1983-84

	Ontario Government Funding	Grants, Donations
Centralia College	$ 124,200	$ 53,962
Energy Centre	665,000	—
Education and Research	2,058,400	153
Horticultural Research Institute	3,072,000	160,778
Kemptville College	2,413,300	48,654
New Liskeard College	653,400	37,493
Ridgetown College	1,995,700	158,041
University of Guelph	17,350,000	170,475
	$28,332,000	$629,556

INTRODUCTION

In 1962, the Agricultural Research Institute of Ontario (ARIO) was established by an Act of the Provincial Legislature. The Act charged the ARIO with responsibility for the expenditure of the Ontario Ministry of Agriculture and Food's funds for research programmes in agriculture, veterinary medicine, and household science. Its membership, which is composed largely of farmers and agribusiness people, is designed to reflect the broad interests of the province's agricultural industry. In bimonthly meetings, ARIO members review programmes to determine whether the objectives, facilities, and staff are meeting the industry's current needs, and make recommendations accordingly.

The Institute is concerned primarily with research conducted by the Ministry, which includes animal production, field and horticultural crops, pest management and disease control, soil, water and waste management, food, engineering, and economics. There are seven centres for such research: Agricultural Laboratory Services, Centralia College of Agricultural Technology, Economics Branch, Horticultural Research Institute of Ontario, Kemptville College of Agricultural Technology, New Liskeard College of Agricultural Technology, and Ridgetown College of Agricultural Technology. The 5 experimental stations at Arkell, Cambridge, Elora, Guelph, and Woodstock are managed by the University of Guelph under contract with the Ministry.

Under the Act, the Institute may accept grants or donations of monies for research. Such funding is usually from commercial sources and is used for specific projects.

The ARIO is a corporate body responsible to the Minister.

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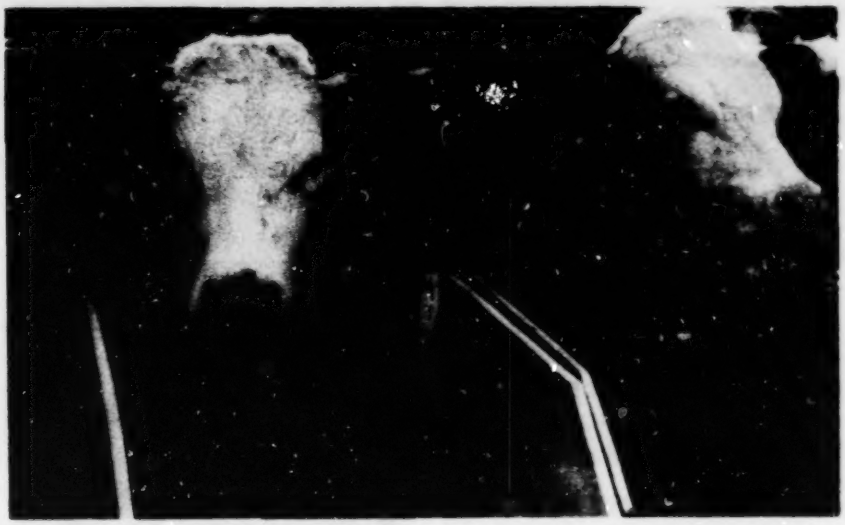
ANIMAL PRODUCTION AND HEALTH

Beef

Beef cattle finished in North on locally grown feeds

The results of extensive beef cattle research should lead to more cattle being finished in the North and more low grade land being put to use for forage production. A three year trial has developed performance characteristics for finishing crossbred beef steers under cold housing conditions on various combinations of barley and formic acid treated, high moisture alfalfa silage. The diets were 100%, 70%, 50% and 25% roughage (dry matter basis) and resulted in average daily gains of 0.73 kg, 0.90 kg, 1.04 kg and 1.35 kg respectively.

These findings complement an earlier cooperative study with Agriculture Canada, Kapuskasing, which showed that treated, high moisture alfalfa silage could maintain significantly higher protein levels than baled hay, and that nutrient loss due to heavy precipitation during June harvests could therefore be minimized. NLCAT



Each of the steers in this feeding trial wears a coded magnet that opens only one of the electronically controlled head gates. The system allows researchers to monitor individual feed intake.

Beef grading revisions bolster export market

Research results have shown that assessing meat yield of beef carcasses at the 12/13th ribs instead of the 11/12th ribs is a more accurate procedure. As of January 1, 1984, the beef carcass grading system was changed to accommodate this finding. As a result of this change, Canadian beef cutting procedures will now meet international standards, and Canadian beef can compete on a more equal basis in the export market. UG

All silage diet for steers brings better returns than grains

Beef producers can realize significant savings by switching their growing and finishing steers from high grain diets to ones high in roughage. In a recent study, five groups of cattle, averaging eight months and 230 kg, were started on feed and fed for 240 days until slaughter. Average slaughter weight was 470 kg. The return on investment was 63% lower for cattle on an 80% grain ration than on an all silage diet. At a 20%, 40%, or 60% grain ration, the return on investment became progressively and substantially lower than the all silage group.

The average price paid for grain was $160 per tonne, whereas the silage cost $30 per tonne. Daily yardage costs and interest on the cattle were also included in the calculations. KCAT

Genetic evaluation of beef sires

Evaluations of beef sires for calving ease, weaning weight, and yearling weight were published for over 2,700 bulls in 1983 using methods and computer programmes developed by animal scientists. The programmes allow for the accurate comparison of herds across Canada by adjusting for such factors as sire, year and season effects, and breed and age of dam. Prior to the programmes, there was only in-herd sire assessment.

The new evaluations form an integral part of the information provided by the AI industry to their customers. It is estimated that currently there is a 1% gain per year in genetic progress in yearling weights. Therefore, this development is worth over $1 million a year to Ontario's beef industry. UG

New residue detection methodology, which uses an automated gas chromatographic system shown here, has been developed. It is being used to monitor animal tissues and products for trace residues of chloramphenicol to ensure the wholesomeness of animal products grown on Ontario farms.

Protein levels for feedlot steers

Early research results suggest some economic advantage to feeding protein above traditionally recommended levels. Large framed crossbred steers responded with a 26.5% faster gain and 5% improved feed conversion ratio with 16% crude protein diet when compared to the 12% control level. Although the 16% diet cost 20% more at 1983 feed prices, this cost can be offset by the improved performance of this type of feedlot animal. RCAT

Selective inbreeding may control bovine leukemia

Veterinary research has shown that the incidence of bovine leukemia may be influenced genetically. The virus responsible for this problem (BLV) is able to invade the cells of some animals but not others. The compatibility of the virus and the cell seems to be a genetic characteristic of the host animal. This observation may explain why the incidence of bovine leukemia is quite constant within herds. Changing the genetic pattern of the herd using selective inbreeding could, therefore, alter the overall incidence of this disease and be used in a control programme. UG

Intramuscular injections of chloramphenicol to be revised

High levels of chloramphenicol have been found at the injection sites of calves, long after the recommended withdrawal times. Chloramphenicol, widely used in the treatment of bacterial diseases of cattle, is available in a number of intramuscularly administered formulations, one of the most popular containing the drug at a concentration of 500 mg/ml. The residues of chloramphenicol were much higher after the 500 mg/ml formulation than when an equivalent dosage of a 200 mg/ml formulation was utilized. It is apparent that either a longer withdrawal period for the 500 mg/ml formulation or even a prohibition against this route of administration in cattle, is required. UG

Veal from heavy calves rated highly

Most Canadians prefer light coloured veal to heavy veal, which has a reddish colour but is cheaper to produce. To increase the acceptability of heavy veal, researchers reduced iron in the diet and consequently lightened the colour. A taste panel identified the traditional white veal as only marginally lighter than the iron-reduced heavy veal, and no differences in tenderness, juiciness, and flavour were noted. KCAT

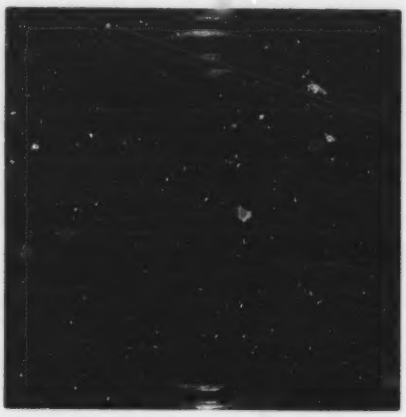
Dairy

Three new models aid sire, cow evaluations

Comparative evaluations of herds and large scale milk recording programmes have been aided considerably by the development of more precise methods for the identification of superior genotypes for dairy performance. The genetic analysis of production differences among dairy herds revealed greater genetic differences among herds for fat percent than for milk and fat yields. This is understandable in view of the higher heritability for fat percent.

Producers in search of genetically desirable bulls will be helped by a new computer model developed for the evaluation of sire effects on body conformation traits. According to the study, traits relating to udder characteristics had the highest genetic correlations with final class. This model makes within-herd, round-of classification and classifier comparisons, thus doubling the accuracy of sire rankings for type.

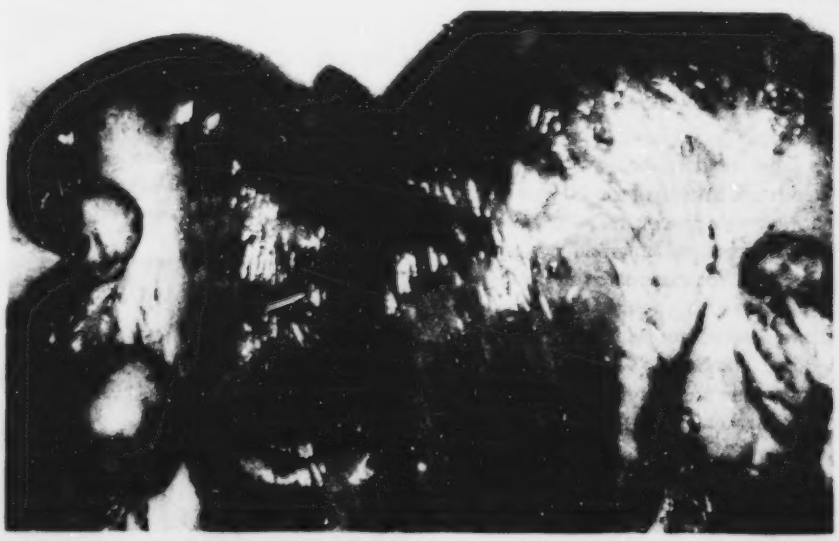
A new model for intraherd evaluation of dairy cows has been developed and assessed. This method has been applied to rank all cows in Canada on their ETA's (an index of transmitting ability) based on production of all female relatives, plus the cow's sire's and grandsire's proofs. Correlations among cow evaluations obtained from different herds were equal to theoretical expectations, indicating a high degree of reliability of this model. According to research results, the primary reason for improvement in the population was AI sires, whereas preferential mating of sires to dams seemed to be of minor significance. UG



This plastic coil is an indwelling inframammary device used to prevent infection by common mastitis pathogens. Its ability to prevent mastitis on a long term basis is being investigated.

Study of disease production and culling in Holstein-Friesian cows

An intensive study of 32 South-central Ontario dairy herds has resulted in a large volume of epidemiologic data with respect to disease occurrence, production levels, reasons for culling, and somatic cell counts in milk. One of the findings identified the linear relationship between the log of somatic cell counts (SCC) and test day milk production. The amount milk production decreased as SCC increased was quantified at 1.44 kg of milk per day decrease for each log unit of SCC increase.



Studies have been conducted on the effects of gonadotrophin releasing hormone and/or prostaglandin administration on uterine involution, ovarian activity, and reproductive performance in postpartum dairy cows.

Over a three year period, 100 dairy farms in West Central Ontario took part in a survey to gather a wide range of information on which sound management decisions could be based. Thus far, the study has generated considerable data on the effect of feeding management on production and disease occurrence in Holstein herds, the influence of a dairy manager's socio-psychological characteristics and management practices on farm performance, the effect that calf management practices have on the productivity and rate of disease occurrence in Ontario Holstein herds, and blood chemistry profiles of Holstein cows.

This finding re-emphasizes the importance of testing dairy herds for sub-clinical levels of mastitis in order to cut losses in milk production. UG

Linseed and oats make cheap emulsifier

A trial has been completed which could have important implications for cream farms, where skim milk is available but energy levels are too low to support the normal growth of new born calves.

College tests have shown that linseed and oats – which can be mixed on the farm – have emulsification properties which make them suitable substitutes for more expensive chemical emulsifiers. Experimental calves fed skim milk, linseed, ground oats and tallow gained 15.8% more than veal calves on a skim milk diet. KCAT

Worming dairy cows at calving increases milk production

In a large scale clinical trial, cows who were wormed on the day of calving produced approximately 21 hectolitres more milk per lactation than control cows who were not wormed. There was considerable variability among farms on the study, and no method has yet been found to predict degree of benefit. However, on average, improved production results from worming cows on the date of calving. UG

Postpartum hormonal treatments enhance reproductive performance

Prostaglandin administered three to four weeks after calving will improve reproductive performance in dairy cows. In an investigation of the effects of GnRH and/or prostaglandins in aiding dairy cows to achieve more efficient return to cyclic reproductive activity and pregnancy, prostaglandin decreased calving to conception interval by 11 days in one herd. In a 200 cow herd, this represents a saving of $7,000 (including medical costs).

To date, the findings with regards to early postpartum GnRH administration have been contradictory. One trial showed an increase in persistent uterine infections with GnRH use. Another study on cows with retained placenta found that GnRH improved reproductive performance over control cows if they were bred early. UG

Swine

Improving productivity of swine operations

Productivity on many of Ontario's swine farms could be increased considerably, according to the results from an extensive survey of 56 representative farms. The survey yielded a wide range of production data: swine herds weaned on the average 16.82 (range 9.06-19.59) pigs per sow per year, producing 57.64 (17.08-98.50) pigs per farrowing crate; average weaning age was 37.5 days; 2.07 litters were produced per sow annually; swine reached market weight (100 kg) in 196 days (range 154-239); and pig mortality ranged from 20% to 50% and was related to management practices.

Among the recommendations of the survey, swine producers are advised to keep herd record systems (computerized for larger herds) in order to spot problem areas in management practices and reduce production costs. (The averages and ranges given for each parameter studied provide a good indication of what the goals should be.) It is suggested that overall productivity of swine could be improved readily by reducing weaning age to approximately 30 days. Further production gains could be made by better use of available space and rearing facilities, reduction of pig mortality through improved management, more efficient use of injectable antibiotics and feed and water medication, and improved control of infectious diseases, particularly pleuropneumonia. UG

New technology for PSE identification

Pale, soft, exudative (PSE) pork has a pale, watery appearance that reduces its acceptability to consumers and, therefore, its market value. An entirely new method for PSE identification in intact carcasses has been invented. It is based on the measurement of the electrical capacitance of the meat under a high frequency, low voltage current. The technology has several advantages over older methods:

the electrodes are made of stainless steel (not glass); the equipment does not require frequent standardization in a solution; and it is available at a relatively low cost. UG

Improved detection of mycotoxins in feeds

Mouldy feeds are of concern to Ontario livestock producers because they frequently contain toxic substances capable of causing serious damage to farm animals, especially swine. Researchers have established methods of detecting mycotoxin levels in feedstuffs and, through feeding trials, have determined critical levels of the mycotoxins zearalenone and vomitoxin in both growing and finishing pigs. With the information available, producers may determine the best alternative for utilizing mycotoxin-contaminated feed. UG

Electronic grading for pork carcasses

A new instrument that provides automated grading of pork carcasses is expected to replace manual measurement in the near future. At present, over 4 million carcasses are graded annually in Ontario by means of a manual measurement of carcass fat depth, which serves as an inverse indicator of lean meat content of the carcass. Application testing of two instruments has shown that the accuracy of predicting carcass lean content can be improved by 20% through the adoption of electronic technology. The same technology would reduce the amount of judgement, potential for error, and labour required to grade a carcass. It would also speed the transfer of data to the marketing board and allow more information to be returned to the producer. National trials are already underway. UG

Determining the nutritional value of feedstuffs

A computer model has been developed that provides estimates of the value of various feedstuffs in swine diets, relative to corn and soybean meal and the price of pork. The new model incorporates estimates of the actual nutritional worth of feedstuffs, based on growth performance and carcass merit characteristics. This represents considerable improvement over previous methods, since they did not adequately consider the effect of feedstuffs on carcass merit. An added advantage of the new model is that relative worth can be determined, depending on the level of incorporation in the diet. RCAT

Economic protein and energy levels in swine diets

Protein and energy levels in corn-soybean meal based diets were examined in a series of trials. Protein levels examined were 13%, 15%, 17%, and 19% with 0%, 3%, 6%, and 9% tallow added. Growth rate and feed conversion improved with tallow added to the ration. Carcass fat was increased with grading index lowered. Although protein levels improved growth performance and feed conversion, the amount of improvement was less at the higher protein levels (17% and 19%). Elevated protein levels decreased carcass fat levels and improved grading index.

The results indicated that a 16% crude protein diet with no extra tallow would be most economical to feed under most normal price relationships among corn, soybean meal, and pork. RCAT

Poultry

Feeding regimens refined for late maturing turkeys

The use of turkey meat in a number of processed products such as turkey roll and luncheon meats is on the increase. For turkey producers interested in pursuing the highly processed market, research has shown the necessity of making adjustments in sequencing feeds for later maturing birds. In a recent experiment, a bird developed by the EEC that yields large amounts of breast meat was compared with a domestic strain usually intended for the whole bird market. Live performance was best with the EEC strain while carcass characteristics were best for the North American strain. EEC feeds had high protein relative to energy and favoured growth of the EEC strain because maturity occurred late in production. Conversely, the North American strain matured early and benefited from the high energy feeds of the North American system. This maturity difference will necessitate additional protein NRC recommendation during the finishing period for EEC strains grown in Canada. UG

High moisture corn found acceptable in poultry diets

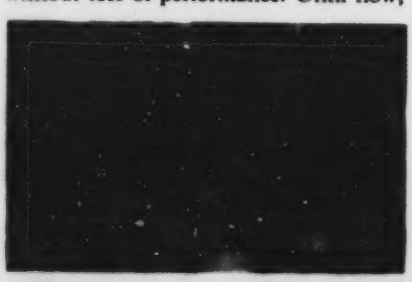
Feeding trials with laying hens and growing pullets have indicated that high moisture corn can be used in poultry diets without loss of performance. Until now, high moisture corn had commonly been fed to swine and beef cattle, but not to poultry. Its use in poultry diets would allow those farmers currently handling the corn greater flexibility and save them $20 to $25 per tonne in drying and handling costs. Researchers have also found that relatively cheap additives can be used to store mixed feed for up to one week without the need for sealed storage. UG

Lighting sequence and poultry reproduction

The lighting regime or photoperiod is the most useful management tool available for the control of egg production and egg quality in hens. Recent research has revealed how the hen converts the changing lighting pattern into the hormonal activity that controls the onset of egg and sperm production, the maintenance of reproductive activity, and the quality of egg products. By maximizing the lighting sequence for the laying hen, the present plateau in egg numbers – about 280 eggs per bird per year – could be overcome. A greater understanding of birds' response to lighting could also help solve problems with eggshell quality, which currently cost the poultry industry about $20 million annually. UG

Controlling broodiness to increase egg production

Broodiness, or the desire to incubate a nest of eggs, is a serious economic problem



The ELISA test, an immunosorbent assay, is now a widely used microtechnique for serological examinations of poultry. Multiple tests are easy and inexpensive to conduct and results can be read visually (right). The ELISA test replaces old sampling methods, such as the one pictured on the left, which were used for detecting infectious antibody in chicken blood samples. This technique required fertile eggs and was both time consuming and expensive.

of the turkey industry. Although selection for egg production has reduced the frequency of maternal behaviour, approximately one third of all turkey hens still exhibits the desire to incubate. In an effort to cut losses in egg production, researchers are investigating ways of controlling the dramatic physiological changes that turkey hens undergo during broodiness.

Thus far, they have found that the desire to incubate is preceded by a reduction in feed and water intake. When incubation begins, feed and water intake are reduced by 95%. The concentrations of the hormone prolactin are increased by 200%.

It is estimated that the control of broodiness could raise annual egg production levels of broody hens from approximately 85 eggs to 130. UG

Other

Pasture finishing of lambs

Lambs can be finished on pasture in Northern Ontario with carcass characteristics similar to those fed in confinement, according to the results of a recent trial.

Although pasture lambs took 21 days more to reach the same fat thickness as confinement lambs on a finishing diet of 88% concentrates, carcass characteristics, composition, tissue and offal distribution were similar in the two groups. This is one of the findings of a major comparative study of pasture, confinement, and semi confinement management systems and their effects on finishing two weights of heavy lambs. The study is in place to help Ontario producers determine the most cost effective method of raising sheep for their particular operations. NLCAT

New strategy for Pseudomonas Pneumonia control in mink

Outbreaks of Pseudomonas Pneumonia can cause serious losses on mink ranches. Various serotypes of Pseudomonas *Aeruginosa* differ in their sensitity to sulfathiazole. Researchers have found that the use of sulfathiazole in the water may substantially reduce mortality, provided therapy is begun prior to exposure and the Pseudomonas *Aeruginosa* is sensitive to sulfathiazole. This measure, in addition to sanitation and vaccination at the start of an outbreak, should minimize the spread of the disease throughout the remaining herd. UG

FIELD CROPS

Grain

Maximum yield trials of corn more than double average yields

Maximum yield trials of corn were initiated with a view to helping farmers increase yields and decrease their unit cost of production. Initial results have been impressive: yields of 15.8 tonnes per hectare of grain corn were recorded in research plots near Chatham in 1982, with similar results in 1983. The average provincial yield is 6.3 t per ha. To date, the major factor contributing to the high yields has been the interaction of high yielding hybrids with sufficient stalk strength and consistent ear size – among other characteristics – to tolerate high population conditions. Other factors, such as plant nutrients and irrigation, have proven less significant. RCAT

New winter triticale cultivar features superior lodging resistance

A new winter triticale variety, "OAC Decade", was licensed this year. One of OAC Decade's main strengths is its resistance to lodging; it is 35 cm shorter than OAC Wintri. In provincial trials, OAC Decade outyielded seed wheat by 6% to 10%, averaging 4.93 tonnes per ha grain yield. It is similar to OAC Wintri in winter survival and in resistance to powdery mildew, septoria, and leaf rust.

It is anticipated that seed will be available to growers by the fall of 1985. UG

Seeding date crucial for winter wheat

Seeding wheat either too early or too late can result in significantly reduced yields due to disease and/or winterkill. In recent years, for example, wheat sown too early led to outbreaks of Take-All disease, resulting in a drop in yield from a potential 4 tonnes per hectare to 0.7 t per ha. Crop scientists have found that wheat in an area with over 3,000 CHU should not be sown prior to September 25 and later than October 10. Long term tests showed that wheat grown in this area will not survive winter when planted after November 1.

Wheat sown after October 10 but before November 1 gave lower yields by 0.2 t per ha per week delay in seeding and a lower test weight of 1 kg per ha per week. Industry has incorporated this information in cereal production advice to farmers. RCAT

"OAC Acton": barley variety overcomes disease problems

"OAC Acton", a new winter barley variety, has been developed to overcome such problems as scald and barley yellow dwarf virus that have plagued older varieties. In addition to improved disease resistance, OAC Acton outyielded other varieties such as OAC Halton by 7.2% on average, and had better resistance to lodging. Growers are cautioned, however, that OAC Acton has similar limitations regarding winter hardiness.

Seed is expected to be available to growers by the fall of 1985. UG

Maximum yield trials for corn are designed to help farmers raise their crop yields and lower their unit cost of production.

New seeding method proves cost effective

A new seeding system, in which a wheat-fertilizer mix is broadcasted and lightly incorporated, has resulted in yields equal to those gained by the conventional grain drill method. The new system allows quick seeding of large hectareages: 20 ha per hour versus 2 ha per hour with a grain drill. It eliminates both the need for handling fertilizer and for owning a grain drill. (Custom seeding with a grain drill is difficult to obtain during busy harvest times.) Cost for mixing, delivery, and broadcasting has averaged $14 per ha in recent years. The new system has gained wide acceptance among growers: 12,000 to 15,000 ha are now sown annually in this manner. RCAT

Growth regulator keeps cereals standing

Lodged cereals result in lower yields and poor quality lightweight kernels that are often discoloured, infected with disease, and sometimes sprouted. It costs three times more to harvest a lodged crop of grain than a standing one: $200 per ha as compared with $66 per ha. Three year tests with ethephon on 6-row barley and winter wheat have proven its effectiveness in reducing lodging. A 45% increase in yield of Vanier barley was obtained when ethephon prevented early lodging of this crop. Its registration is anticipated. RCAT

New silage testing programme

The Ontario Ministry of Agriculture and Food has initiated a silage testing programme as a result of a two year study. Prior to the programme, corn hybrids for silage production were selected according to their grain yields. The study showed, however, that there is considerable variation among corn hybrids for whole plant (silage) yield and quality, and that these silage performance parameters are not predicted by a hybrid's performance when grown for grain. UG

Forage

Leafcutter bee to activate alfalfa seed production

The leafcutter bee is proving a reliable pollinator of alfalfa stands in the cooler temperatures of the North. As part of a NORDA-funded project aimed at increasing the production of alfalfa seed in Northern Ontario, test sites were established in the Timiskaming district with

Shown here are alfalfa seedlings after inoculation with the organism causing verticillium wilt. The lower group of plants is turning white and dying, while the upper group is resistant to the disease. Registration of a verticillium wilt resistant variety is anticipated in the next year.

cocoons purchased from Saskatchewan. Initial seed yields compared favourably with the range of 200-400 kg per ha usually quoted by Western Canadian producers, and the ratio of cocoon increase also lay within the range of 2-3.1 experienced in the West.

Currently, the value of alfalfa seed brought into Ontario each year is $7.5 million. NLCAT

Increased winter survival lowers production costs

The average life of an alfalfa stand in Ontario is 3.9 years. Winterkilling in the first or second year of a stand reduces available feed and necessitates re-seeding. It is most likely to occur following a warm wet fall and/or during a winter with little snow cover. Proper harvesting followed by a fall rest period for the plant, plus adequate top growth to hold the snow, increase the chances of survival. Crop scientists have developed technology to evaluate plants for survival in low temperatures, a step that will facilitate the development of hardier cultivars. A new cultivar, OAC Minto, was licensed for sale in 1983. This cultivar is high in yield and more winterhardy than the cultivar Iroquois. UG

Grasses provide long term alternative to legumes

Researchers have found that high forage yields are possible using a simple combination of grasses and nitrogen fertilization. Seventeen years after establishment, grass plots in Northern Ontario were still yielding up to 8.8 tonnes of dry matter per hectare with nitrogen levels up to 200 kilograms per hectare. (Economic yield levels can be achieved with 150 kilograms per hectare.) As the study has proven, grasses are an economic alternative to legumes in the North, particularly when the costs of reseeding and lost production years associated with the less persistent legumes are taken into account. NLCAT

Improving the establishment of birdsfoot trefoil

Although birdsfoot trefoil is an ideal legume for pastures, it is difficult to establish. After several years of selection for seedling vigour and competitiveness, several strains have been identified that are superior to the cultivar Leo. The strains are now being tested across Ontario.

Lodged barley is time consuming to harvest and produces poor quality, lightweight kernels. In research trials, ethephon or "cerone" applied to spring barley resulted in more erect barley heads and shorter plants that were much less prone to lodging.

In other research on the causes of poor establishment, two circumstances that markedly reduce seedling vigour were identified: dehydration following water absorption by seeds, and exposure of seeds to high temperatures immediately after harvest. Wetting and drying of seed in the swath prior to combining had no effect on vigour of the seedlings. UG

Protein & Oilseed

"OAC Triton": a world first

"OAC Triton" is the world's first triazine-resistant canola. OAC Triton's resistance to triazine herbicides such as atrazine, cyanazine, and metribuzin will allow farmers to control closely related weeds such as wild mustard and stinkweed, among others, in their spring canola crops using effective and inexpensive herbicides. This new variety can also be used as a crop in which perennial weeds like quackgrass can be controlled, or subsequent to a crop upon which trizines had been applied. In 1984, the first year of release, OAC Triton was grown on about 16,000 hectares in Canada.

The resistance to triazine herbicides was derived from bird rape, which became a weed problem in long-term corn fields in Quebec. The resistance trait is maternally inherited, is stable in production fields, and can be transferred to other varieties. Further improvements in triazine-resistant varieties are anticipated. UG

Soybeans superior to canola in East

The question of whether to grow canola or soybeans in Eastern Ontario has been decided in favour of soybeans. In a recent comparison of Canada's two major oilseed crops, yields for soybeans were substantially higher. On sandy loam, soybeans yielded 258 kg per ha more than canola; on clay soil, soybeans yielded 258 kg per ha more.

Soybean production hit a new high with an estimated 12,000 ha grown in the East this past year. New unlicensed varieties have produced higher yields than the popular Maple Arrow variety, and additional studies with lower seeding rates have confirmed that rates 40% below normal had no effect on yields due to additional branching. KCAT

With high yields and research breakthroughs in plant breeding, winter canola is an increasingly popular crop for Western Ontario growers. One problem being investigated is that of root systems plugging field tiles, as shown here.

The release of "OAC Triton", a spring canola resistant to triazine herbicides, has stimulated production in the province. Plantings have increased from 1,000 ha in 1982 to 11,000 ha in 1984.

Winter canola yields high in the West

The interest in canola, and winter canola/rapeseed in particular, has grown considerably in Western Ontario in recent years. In 1984, production increased to about 2,000 hectares and may reach 5,000 hectares in 1985. Because of superior yields, winter canola is preferred to spring canola: yields as high as 4,500 kg per ha have been reported in research trials. Tests continue on varieties, fertilizers, planting dates, and seeding rates in order to develop a full complement of recommendations for growers. It is hoped that some varieties will be licensed later this year.

Soybeans are evaluated in various row widths, including twin rows for possible ridge planting.

Winter canola will only survive on well drained land. There is a problem, however, with roots systems plugging tile drainage systems. This situation is being studied. CCAT

HORTICULTURAL CROPS

Vegetable

New cucumber, cauliflower cultivars recommended

Several new cucumber cultivars, namely Tamor, Score, Tally, Carolina and Peto Triplemech, were recommended recently and are now in use by industry. Most of these cultivars have resistance or tolerance of up to 6 of the major cucumber diseases (scab, virus, angular leaf-spot, anthracnose, powdery and downy mildew). Older cultivars have resistance only to scab and virus. In addition, the new cultivars produce more female flowers and outyield older cultivars in some cases by 30%.

In cole crop cultivar testing, the superiority of cauliflower cultivars from Holland remains a dominant feature. One new Dutch cultivar, ANDES, has been added to the recommended list for Ontario. HRIO

Mushroom studies may eliminate need for casing layer

Research findings on the microbial ecology of the mushroom casing layer may free growers from the need to add costly casing layers. Studies have confirmed the role of bacteria and ethylene in the initiation of fruit bodies of *Agaricus brunnescens*. The microbial population of the casing layer reduces mycelial growth, probably by nutrient competition, and this reduced growth rate in conjunction with ethylene produced by both the fungal mycelium and bacteria induce a fungistatic effect that results in mushroom fruiting. This work may lead to the elimination of casing layers, which at the present cost of $2.69 per metre square would mean an annual

saving of $2 million to the province's industry. HRIO

Domestic celery for Christmas?

Storage specialists are developing technologies to help celery growers prolong the marketable life of their produce. Post-harvest physiology research indicates that modified storage atmospheres can extend storage life by up to two months. In a recent trial, celery placed in open plastic containers and stored in a forced air, high humidity storage kept for 112 days with only 7% loss in weight. The incidence of blackstem was reduced considerably. Two other approaches – one using levels of carbon monoxide, the other the removal or "scrubbing" of ethylene – are being investigated. Optimum storage atmospheres will help Ontario growers increase returns from celery, the retail value of which can double between September and October. HRIO

Good yields reported for alternate greenhouse crops

Sweet peppers and gypsophilia (Baby's Breath) are promising candidates as alternate crops for greenhouse production. Extensive trials have been conducted to establish the economic feasibility of various crops. Sweet pepper yields exceeded 15 kg per square metre, and the first crop of gypsophilia was similarly encouraging. Growing costs and returns have yet to be determined before commercial recommendations can be made, however. HRIO

A crop heating system is installed in the new energy efficient greenhouse complex at Vineland Station.

Early bell peppers are in great demand, especially for the fresh market trade. The province's pepper breeding programme has led to the development of several bell type cultivars that ripen approximately one week earlier than commercial introductions. This material has been made available to the seed trade.

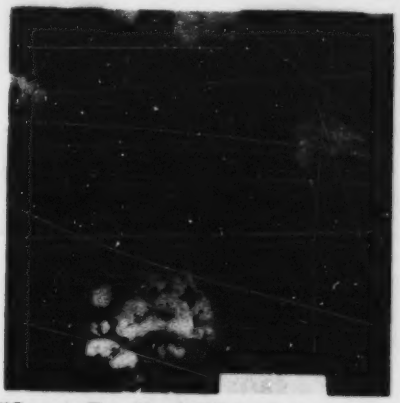
Ornamental

Ontario Two Hundred – a new geranium introduction

A new geranium cultivar has been developed to commemorate Ontario's bicentennial. "Ontario Two Hundred" has a well-rounded, deep scarlet, semi-double, non-shattering flower. The plant, measuring 35 cm x 35 cm, branches well in the field and has lightly zoned leaves. It is very floriferous, bearing 10 to 12 flowers at one time, each of which has 50 to 60 florets. The flower stems are long, holding the inforescences well above the foliage. The cultivar is vegetatively propagated, producing many cuttings which root easily. It is also easily propagated from shoot tips in tissue culture. UG

Carbon dioxide plays vital role in greenhouse crops

Energy conservation practices used in the winter to cut energy loss from greenhouses by reducing air infiltration can severely restrict the replacement of CO_2 consumed by the crop during the day. Thus, on a cold sunny winter day, the CO_2 concentration in the greenhouse can drop to 200 ppm, well below the ambient (300 to 500 ppm). This deficiency in CO_2 severely restricts the photosynthetic rate and as a consequence slows plant growth rate and affects potential crop productivity and quality. In one study, daytime CO_2 enrichment (1300 ppm) of chrysanthemum stock plants increased the yield of cuttings by 69% over the



"Ontario Two Hundred" is a new geranium cultivar developed to commemorate Ontario's bicentennial. It features a well-rounded, deep scarlet, semi-double, non-shattering flower.

This portable photosynthesis measuring device is helping researchers determine the effects of environmental changes on plant development. The device collates aspects of light, temperature, and CO_2 depletion and determines the rate of photosynthesis.

control plants. When CO_2 at 1300 ppm and 5 klux illumination from high pressure sodium lamps were used together, a 247% increase in cuttings was obtained over the control plants. UG

Growth retardant improves overseeding of turf

Overseeding undisturbed turf is usually unsuccessful because existing turf competes with the overseeded seedlings. Chemicals such as glyphosate, which are used to increase overseeding success, kill the existing turf and result in an unacceptable turf appearance. Research has shown that the growth retardant Mefluidide increased turf overseeding success without severe turf discolouration. While some turf discolouration occurred for several weeks after treatment at the highest rates, the turf appearance was generally acceptable. UG

Fruit

Early figures encouraging for processing strawberry industry

A major strawberry project, which takes a complete systems approach to production, breeding, harvesting, processing economics and market acceptability of machine harvested processing berries, has produced favourable findings in its second year. Preliminary results indicate that solid beds produce higher yields of good quality berries more economically than traditional matted rows. It cost on average 21.5¢ per kg to produce fruit on solid bed and 53¢ per kg on matted row. In another comparative study of solid bed versus matted row, hand versus machine harvest, and once-over versus multiple harvest, it was shown that fruit could be harvested most economically on solid beds with a once-over machine harvest. Strawberry yields from solid beds were 16,800 kg per ha on some cultivars. From this, 8,400 kg were processed as No. 1 berries and 4,500 kg were processed as puree. Costs of production per kg of field harvested product are 21.5¢, 30¢ for harvesting, 2¢ for transport, and 23¢ for processing equipment. With a recovery rate of 73% and a processing cost of 57¢ per processed kg, the actual total cost from growing to pack is $1.61 per kg.

These preliminary results bode well for the future profitability and competitiveness of Ontario's processing strawberry industry. HRIO

Veecling peach a winner for Ontario's processors

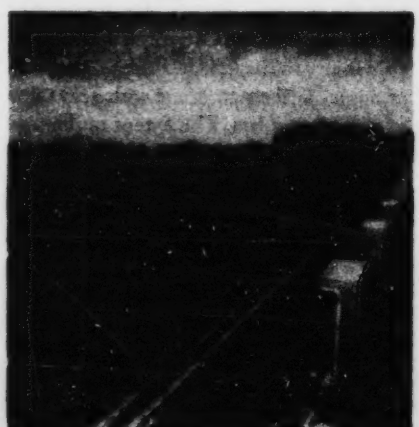
Veecling peaches are playing a key role in strengthening Ontario's processing peach industry. Veecling, originally introduced in 1974 by HRIO's breeding programme, represented 10% of all clingstone peaches in the province in 1981. In 1983, 49% of all clingstone planted were Veecling, and by 1990 the farmgate value of Veecling production will be in excess of $2 million. Veecling fulfills industry's need for a high quality, early and uniform ripening canning peach, characteristics which allow for the more efficient operation of processing plants. HRIO

New grape varieties welcomed by industry

Varieties developed under the grape breeding programme are being adopted by an increasing number of growers. In 1983, 428 ha of Vineland cultivars were planted in the province. A total of 8,500 vines of Vivant, a new release, was planted in 1983. Vivant was developed in response to industry requests for a sturdy, light-charactered cultivar, suitable for high quality white wine. It machine harvests well and yields approximately 15 tonnes per hectare. Enologically, Vivant has proven to have excellent table wine character. The consistently sound grape condition, good juice yield, high sugar yields and low acid levels make it an excellent wine grape. HRIO

Improved strawberry plant propagation facilitics

The Ontario strawberry plant propagation programme has had its capacity to produce elite plants increased by half with the erection of a new screenhouse at Vineland Station. The propagators in the programme are now able to supply 15 to 20 million plants to strawberry growers each year from the 60,000 elite plants supplied to them. HRIO



Peaches are shown growing in a protected environment structure. During the summer months, the plastic roofing material is removed (left). Peach trees being harvested in the new structure are in third leaf and are grown on various trellising systems (right).

Long term European plum trials on sandy loam soil concluded

Extensive studies of European plum cultivars grown on 3 clonally propagated roots have concluded that there are no appreciable differences in the rootstocks when grown on sandy loam soils. Although initially the cumulative yield per tree (kg) was lower on Myrobolan B than on St. Julien A and Brompton, no yield difference has been observed since 1979. Irrespective of roots, Verity and Italian had the highest and lowest cumulative yield per tree respectively. No total yield difference was observed between Iroquois, Stanley, and Valor. Bluebell had second lowest yield after Italian. Cumulative yield per tree and trunk cross-sectional area for mechanically summer sheared trees were smaller than those trained to modified leader. HRIO

Introduced in 1974, the Veecling peach is growing steadily in popularity. In 1983, 49% of all clingstone planted in Ontario were Veecling.

Maturity indices for Ontario apples

As the quantity of apples produced and stored in Ontario expands, the importance of selecting the right harvest date – particularly for apples destined for long-term storage in controlled atmospheres – is being recognized increasingly. Based on 20 years of research data, the province's producers and storage operators can use calendar date and the number of days from full bloom to first acceptable harvest as the most reliable indicators. In formulating maturity indices, researchers have also found that: a) starch index and firmness may indicate minimum levels of acceptability for long-term storage; b) soluble solids content could be used in conjunction with firmness as an index for cultivars with high sugar content and; c) apples producing high levels of ethylene may be too ripe for long term storage. UG

"Mark" apple rootstock ready for commercial release

Evaluation of new rootstock selections has given an initial high rating to the "Mark" (MAC-9) from Michigan. This rootstock, which will soon reach commercial channels, has been the most productive in the first four years of a test involving nine rootstocks and rootstock candidates. In addition to displaying excellent size control, Mark has so far shown no tendency to lean or fall over. A highly productive, free standing dwarfing apple rootstock would represent a significant gain for the province's apple industry, currently valued at $35 million annually. HRIO

New protected environment structure gets favourable review

The preliminary economic analysis of peach production in an experimental protected environment structure is encouraging. The analysis, which included a monitoring of capital costs, interest rates, electricity bills, etc., revealed yields in excess of 89.45 tonnes per hectare, with an anticipated return of $1.10 per kg or $1,100 per tonne. In addition, the peaches went on market a full month before normal production schedule. It appears that the greenhouse-like facility can fulfill the anticipated advantages of early ripening, increased yields, freedom from canker disease, and production in cooler regions. There is considerable interest among commercial growers in the structure, which features a removable double layer plastic roof.

In addition to peaches, the potential for kiwifruit, Granny Smith apples, vinifera table grapes and tayberries is being assessed. HRIO

Northern Spy may be revived under new management

The Northern Spy apple is an important processing cultivar which suffers from high vigour and reduced productivity. To overcome this cultivar's shortcomings, strategies for daminozide and ethephon use are being developed. After two years, spring and mid-summer treatment have doubled yield while improving fruit quality, but postharvest daminozide application has been disappointing. Pruning time has been reduced 38% where yields were increased, and control of tree size has been facilitated. If higher yields can be achieved consistently, this programme may encourage growers to regain interest in Northern Spys. HRIO

Simulated acid rain injury to apples

Rainfall is an important component of the water balance of horticultural crops, and the potential impact of acid rain is of increasing concern. Research has shown that injury to the foliage, flowers, and fruit of apples is likely to occur with acid rains of pH 3.0 and less. The extent of damage differs among plant parts and among cultivars. In the case of McIntosh, for example, premature ripening and fruit drop resulted. With the exception of McIntosh, yield was not related to foliar injury in one year studies. However, there were indications from third year fruit set data that the injury could be latent and not expressed until at least the third year. Caution is needed, however, in relating immediate plant injury from acid rain to long term yields of perennial woody plants. UG

PEST MANAGEMENT AND DISEASE CONTROL

Hope for nematode control

A fungus has been discovered that may help to control parasitic nematodes in horticultural crops. The fungus exudes a potent toxin in discrete droplets over its surface. When a nematode touches one of these droplets, it is rapidly immobilized by the paralysing effect of the toxin; subsequently the fungus invades the nematode and consumes it. Further studies of the biology and chemistry of the fungus may point to a new class of natural compounds of value in the control of nematodes, which are responsible for a number of root problems in fruit trees, vegetables, and ornamentals. UG

Genetic resistance to bacterial speck

A new gene in tomato has been identified that confers resistance to the bacterial speck pathogen. This resistance is currently available in the breeding line ONT 7710 and is now being used commercially by plant breeders within the tomato processing industry. It is expected that the introduction of this gene into commercial cultivars will reduce considerably the bacterial speck problem in Southern Ontario's tomato fields. UG

Total weed control programme for processing tomatoes

A new herbicide combination can save processing tomato growers $250 per ha in hoeing costs. Long term research efforts into the development of an economical weed control programme for processing tomatoes have culminated in the recent registration of a preplant incorporated application of Treflan plus Suncor followed by a directed postemergence application of Sencor. Together with cultivation, this treatment can eliminate the need for hoeing. At present, approximately 12,000 hectares of processing tomatoes are grown in Ontario. RCAT

Certain practices found to alleviate severity of bean root rot

Growers are being advised to adopt management strategies, such as the careful selection of soil type and attention to rotation, to alleviate the severity of bean root rot. The disease has proven particularly difficult to combat because its causal agent is highly variable. Scientists are searching for significant levels of root resistance that plant breeders can readily incorporate into their breeding lines. UG

Promising herbicides for onions

Extensive trials have been conducted to support the registration of propachlor, oxyfluorfen, and fluazifop butyl for use in onion fields. In recent years, weed control in onions has become inceasingly difficult with the withdrawal of several herbicides from the market. It is hoped that data from the trials, which included residue testing, will result in new registrations in the next year. ALS

Control of problem weeds in asparagus

Field Horsetail is a major weed problem in asparagus. An intense competitor, it can severely suppress asparagus growth and yield and interfere with the harvesting

Reduced rates of Roundup ensure one season's quackgrass control at a reasonable cost. Researchers found that the rate and cost could be reduced from 50% to 75% by reducing the rate of water carrier during spraying and by improving water quality. In 1983, 80,000 to 100,000 ha were sprayed at the reduced rate, thereby saving Ontario growers approximately $3 million. Wick application of Roundup (bottom) is providing another dimension in the economical control of weeds that grow taller than the crop, especially perennial ones.

process. The past three years of research have shown that the herbicides 2,4-D and Gramoxone give only short term control (about 3 to 4 weeks). Full season control and control in the following season are obtained only with amitrole, applied at the maximum rate immediately after the last harvest. Growers can also prevent buildup and control many other weeds by rotating the available herbicides on a regular basis. To date, there is no evidence that rotating herbicides has any effect on reducing herbicide residues in the soil. HRIO

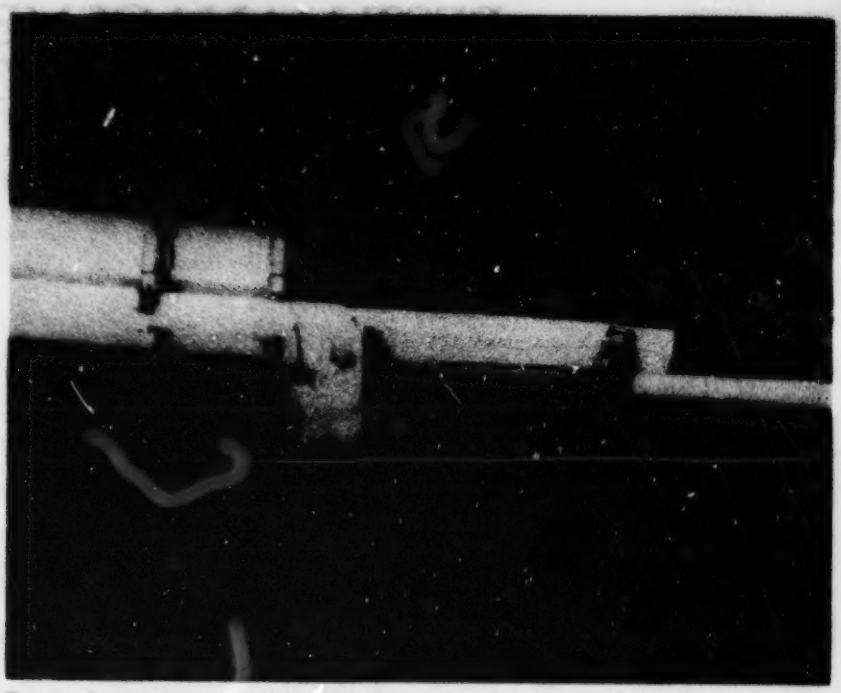
Grass control with post-emergence herbicides in broadleaf crops

A number of new herbicides are receiving attention because of their ability to control emerged grass in emerged broadleaf crops. Sethoxydim and fluazifop butyl have been registered for some crops. These and others are being evaluated for use on ornamentals, fruit and vegetable crops, soybeans, canola, flax, and perennial legumes. These postemergence materials are useful to farmers because they provide a rescue treatment where other methods have failed to give grass control. Alternatively, they can be used as spot treatments, that is, used only where the weed appears. UG

Quackgrass rhizomes are excavated to determine the effect of control methods.

Insect pheromones minimize spraying costs

Insect pheromones are very effective for monitoring pest populations to determine need for treatment. In the case of the corn rootworm, for example, pheromones are used to attract and trap adult males, thereby facilitating accurate predictions of infestations and appropriate spray regimes. Pheromones also have great potential as environmentally safe, species-specific controls, chiefly in the form of mating disruption which minimizes the need for pesticide applications. Researchers have recently identified the pheromone volatile blend or "perfume" of the corn earworm and tobacco budworm. The pheromone of the potato stem borer, an important pest of corn and other crops, has also been identified. Continuing research should permit the development of cheap and effective sampling methods that could eventually be put to control purposes. UG



Recent advancements in weather collecting devices and the increased speed in which this information can be analyzed have led to an investigation of weather-timed spraying of tomatoes. A model, pictured above, is being field tested. If found successful, Ontario growers would save a minimum of $0.5 million each time an application was deemed unnecessary by the device.

Forecasters ensure efficiency of fungicide applications

Two simple disease-forecasting techniques for on-farm use have been developed. The forecaster BOTCAST, based on in-crop monitoring of temperature and leaf wetness, has been field tested for controlling Botrytis foliage disease in onions. The DOWNCAST forecaster works in a similar way to control onion down mildew. The use of forecasters means that initial sprays can be delayed safely, thereby reducing the amount of pesticide needed during the crop year. In other seasons, forecasting techniques can alert growers of the need for an early start to spray operations. UG

Pest control for intensively managed cereals

The increasing interest in refining intensive management practices for wheat and barley production has led to studies of the feasibility of pesticide use. Thus far, research has shown the effectiveness of such fungicides as Tilt and Bayleton and combinations with others such as Bravo. When applied at very low doses, these fungicides can effectively manage various cereal diseases such as Septoria blotches, Fusarium head blight and powdery mildew. Their use also promotes yields. UG

Triazine resistance: problems and opportunities

The shift of lambsquarters and pigweed populations toward triazine resistance is causing additional problems to an increasing number of corn growers in the province. Until recently, the problem had been centered in Waterloo and Huron Counties, but has now been detected in Kent and Essex Counties. Procedures have been developed for the use of many herbicides such as dicamba, 2,4-D, bromoxynil, and bentazon, for the control of these weeds in corn. Although the treatments can provide excellent weed control, they usually require the farmer to make an extra trip over the field. Research continues in an attempt to discover and register treatments that can give prolonged control when applied close to planting time.

Triazine resistance has been transferred to canola and rutabagas and promises to provide a means of controlling common mustard in these crops. Metribuzin and cyanazine are now registered for use on triazine resistant canola. However, there is some concern that this weed control advantage may not last because a triazine resistant mustard has been found in Eastern Ontario. UG

SOIL AND WATER MANAGEMENT

Red clover as plowdown boosts corn yields, adds N

Red clover is a good source of nitrogen for the succeeding crop and improves soil structure. Yield response of barley to red clover has shown that, contrary to popular belief, single-cut red clover is as beneficial as double-cut in supplying N to succeeding crops. This is good news for growers, as double-cut red clover seed is more expensive than single-cut.

Soil scientists also observed that there was no significant carryover of residual N from red clover to a succeeding crop.

In other red clover research, 40 strains were evaluated for production of forage and of roots. Corn following red clover yielded 1500 kg per ha more grain than corn following corn. Yields of corn following red clover varied, depending upon the clover strain. UG

N fertilization recommendations revised for winter wheat

The yield data from 48 different field tests conducted since 1960 in Central and Southwestern Ontario on the response of winter wheat to nitrogen fertilizer rates have been used to develop new N fertilization recommendations. These new recommendations are based partly on the cost of N fertilizer and partly on the expected yield on a given field so that producers may realize maximum profit from N fertilization. The proposed recommended N rates are 80 to 70 kg per ha for the 3 to 3.9 t per ha yield range; 90 to 80 kg N per ha for the 4 to 4.9 t per ha range; and 100 to 105 kg N per ha for the 5 to 5.9 t per ha range. The decrease in recommended N in each case corresponds to a cost of fertilizer nitrogen increase from 60¢ to 80¢ per kg N. UG

Windbreaks increase crop yields, protect soils

As the movement away from livestock-based farming units to cash cropping systems continues to gain momentum, concern over soil erosion by wind is increasing. The past four years of research have demonstrated excellent yield improvements due to windbreak protection: grain corn yields increased by about 10% and soybeans by about 20%. These beneficial effects occurred on both sides of the windbreak. In general, the zone of influence on the leeward side extends outward to approximately 10 times the height of the tree barrier. RCAT

Irrigation increases corn yields

Irrigation of field corn should become more popular as the use of crop rotations to control soil degradation increases. Irrigation could help farmers maintain grain corn production on reduced acreages. Yields of silage corn and grain corn increased by 40% and 30% respectively in experiments on a silt loam soil in a dry year, when irrigation was combined with increased N and plant population levels.

Many farmers on sandy soils in the tobacco growing area stand to gain the most from irrigating field corn, in part because they have already made the initial capital investment. In addition, irrigation virtually ensures yield increases on Ontario's sandy soils; in some years, yields will more than double with properly timed irrigations. During a wet year (1982), researchers obtained yield increases of nearly 10% on a loamy sand soil by irrigating during relatively short dry periods of a week to 10 days. UG

Methoxychlor, a pesticide, is sprayed into limnocorrals to assess its effect on aquatic systems. Similar water quality studies are underway with other pesticides such as atrazine.

Strip tillage for tomatoes preserves soil, maintains yields

One method of conservation tillage for possible use with machine-harvested processing tomatoes is known as "strip tillage". In a recent trial, a rye cover crop was killed with glyphosate in the spring. Narrow strips were then rototilled into the covercrop to establish a seed bed. Tomatoes were transplanted into the narrow strip of tilled soil, and the plots were harvested by machine. No differences in yield between tomatoes grown with strip and conventional tillage were noted. Harvesting of strip tilled plots posed no major problems for the mechanical harvester.

The adoption of conservation tillage by growers would conserve soil moisture, reduce soil erosion and compaction and the sandblasting of tender seedlings and transplants, and may improve soil organic matter in the long term. HRIO

Refining the zero tillage option

Corn yields following zero tillage have been consistently lower (by 10% to 15%) than those following conventional soil tillage. However, yield data indicate that moving the residue to the centre of the interrow space results in zero tillage yields comparable to those with conventionally tilled soil. When a practical method to residue management is developed, zero tillage will become a more acceptable practice for reducing energy requirements, seed bed preparation and crop planting time, and, especially, soil erosion. UG

Significant yield increases in grain corn and soybeans have been recorded through the use of windbreaks. Among the most suitable species for windbreak plantings in Southwestern Ontario are white spruce, Norway spruce, and white cedar.

Soil drainage and crop response

Research has confirmed that tile drainage of imperfectly and poorly drained soil results in the maintenance of alfalfa in alfalfa/brome stands. After three years, the percentage of alfalfa stands was reduced from about 30% on tile drained land to about 5% on untiled land. The addition of potassium fertilizer had no influence on the alfalfa percentage on untiled soil, but tended to increase it on tiled soil. However, the optimum K fertilizer rate for alfalfa stand maintenance tended to coincide with that for maximum economic yield.

In the following year, corn yields on these plots were closely related to the percentage alfalfa in a stand, indicating a response to fixed N. The response of birdsfoot trefoil in trefoil/timothy stand to tile drainage was noteworthy only on poorly drained soil, but not nearly as pronounced as with alfalfa. UG

Composted sewage sludge, properly matured, has been found beneficial to corn production. In addition, the composts have increased soil nutrient levels and visibly improved the soil structure of clay without increasing the heavy metal content of grain or silage.

FOOD

Preserving nutritional value of fried foods

With the growing popularity of fried foods, nutritionists are taking a closer look at cooking oils and the changes they undergo when heated and exposed to oxygen. For example, some chemical structural changes during heating result in losses of polyunsaturated fatty acids. In addition, the thermal oxidation of fat inhibits the ability of pancreatic enzymes (lipase) to break down the fat. During food preparation, it is recommended that excessive heat and exposure to air be avoided due to the amount of fat with double bonds. Suggested modifications include a change from open kettle and pan frying to pressure-type closed kettle frying, as well as the avoidance of pans made from catalytic metals. By adopting these measures, the nutritional value of fat as a source of dietary essential fatty acids and as an economical concentrated form of energy can be preserved. UG

Whey protein: liability turned asset

Whey is an important potential source of nutrients for humans. Food scientists report some progress in the efficient recovery of whey protein and in its use in new and nutritious food products. Good yields of protein fractions have been separated from cheese whey using heat coagulation and ultrafiltration. These fractions were successfully incorporated into process cheese spreads. Furthermore, it appears feasible for cheesemakers to make use of this formerly wasted by-product fraction by including it in a variety of new cheese foods, such as one combining whey protein and cheddar cheese. By using whey, cheesemakers can also reduce surcharges from waste effluent and safeguard the environment. UG

New grape pressing equipment has been installed in the grape processing area of the Horticultural Products Laboratory at Vineland Station.

Fibre optics speed whole tomato grading

A computerized fibre optic system that measures the surface colour of whole tomatoes appears to be precise, fast, reliable, and inexpensive. Fibre optics could potentially replace current hand grading methods that are insufficiently accurate to discriminate completely all differences in tomato colour. Ultimately, this research should enable processors to pay a fair price for raw materials, while producing whole tomato packs of consistent quality. UG

Canola-derived margarine

Food scientists have made some important progress towards the making of quality margarine from canola oil. A number of relationships affecting the hydrogenation or hardening of canola oil has been established. These include the role of nickel catalysts in the formation of undesirable *trans*-isomers, the effect of sulfur compounds in oil on the production of these *trans*-isomers, and the protective effect of surfactant additives on crystallization. This kind of information makes possible the more effective stabilization of canola-derived food fats and therefore a more consistent and desirable product. UG

ENGINEERING

Economic benefits of weather protection for large round bales

An extensive study that compared the cost of spoiled hay with the costs of various types of weather protection for round bales has been completed. Reports of hay spoilage in different types of storage were compared and costs (per tonne) of usable hay in conventional and large round bales were calculated. In short, it was found that except for very high annual volumes, round bales stored inside have a lower cost than square bales stored inside. Outside storage (no wrap) was the most expensive method, unless spoilage was kept low. At higher volumes, plastic wrap as a storage method became more attractive. UG

Shown here is a strawberry harvester at work in research plots. The development of a commercial-scale mechanical harvester is a key component in the future success of Ontario's processing strawberry industry.

ECONOMICS

Milk production costs

Costs of milk production declined as labour was replaced by capital, as the capital intensive farms expanded and as managerial skills became more decisive. Costs declined as productivity levels increased, up to a point, but increased when very high production levels were attained by means of costly methods. Significant differences in costs were observed when farms were grouped according to technology used and managerial skills but this grouping did not reveal significant differences among regions. This would imply that the regional differences are attributable to farmers adjusting their resource use and production levels to the economic optimum for each geographic region. UG

Financial management practices and skills of Ontario farmers

A survey of farm financial record systems has indicated that although most commercial farmers keep records for tax purposes, less than one half prepares integrated financial accounts of profit and loss statements and balance sheets. Also, only about one third prepares cash flow statements. About 80% of the farms surveyed had data recorded by family members, but about three quarters used accountants or tax filing services to prepare income tax statements. UG

Debt carrying capacity of Ontario farms

The potential survival rate of dairy, beef feedlot, and swine farrow to finish farms that started in 1976 and 1978 with certain debt loads was analyzed. The debt loads were assumed to be 90%, 70%, and 50% of the average capital cost of commercial farms in those years as reported in the Ontario Farm Management and Accounting Report.

On average, farms starting in 1976 with only 50% debt were in sound financial condition in 1983 but farms starting with 90% debt required debt restructuring in 1981 as short term debt became burdensome. The average farm starting in 1976 survived to 1983 but the beef and swine farms that started with 90% debt were still in a precarious financial position in 1983.

Based on the average farm, the farms starting in 1978 did not survive past 1981 unless they were beef and hog farms that started with only 50% debt or dairy farms that started with a debt of 70% or less of capital cost. UG

Farm rental arrangements in Ontario

To generate specific information on farm rental arrangements, economists initiated an annual survey of over 500 farm renters in five regions across the province. They found that since 1971, the amount of land rented has increased by over 50%. Respondents rented 52% of their land and owned 48%. Cash rental arrangements predominated in all five regions; share crop arrangements were popular only in Southwestern Ontario. Cash renters tended to produce dairy, beef, and cash grains (78%), whereas share renters tended to produce solely cash grains (70%). Most rental arrangements were short term (1 to 2 years) and were verbal. Average cash rent paid in Ontario was $121 per hectare ($49 per acre) and ranged from $181 per hectare ($73 per acre) in Southwestern Ontario to $33 per hectare ($13 per acre) in Eastern Ontario. EC

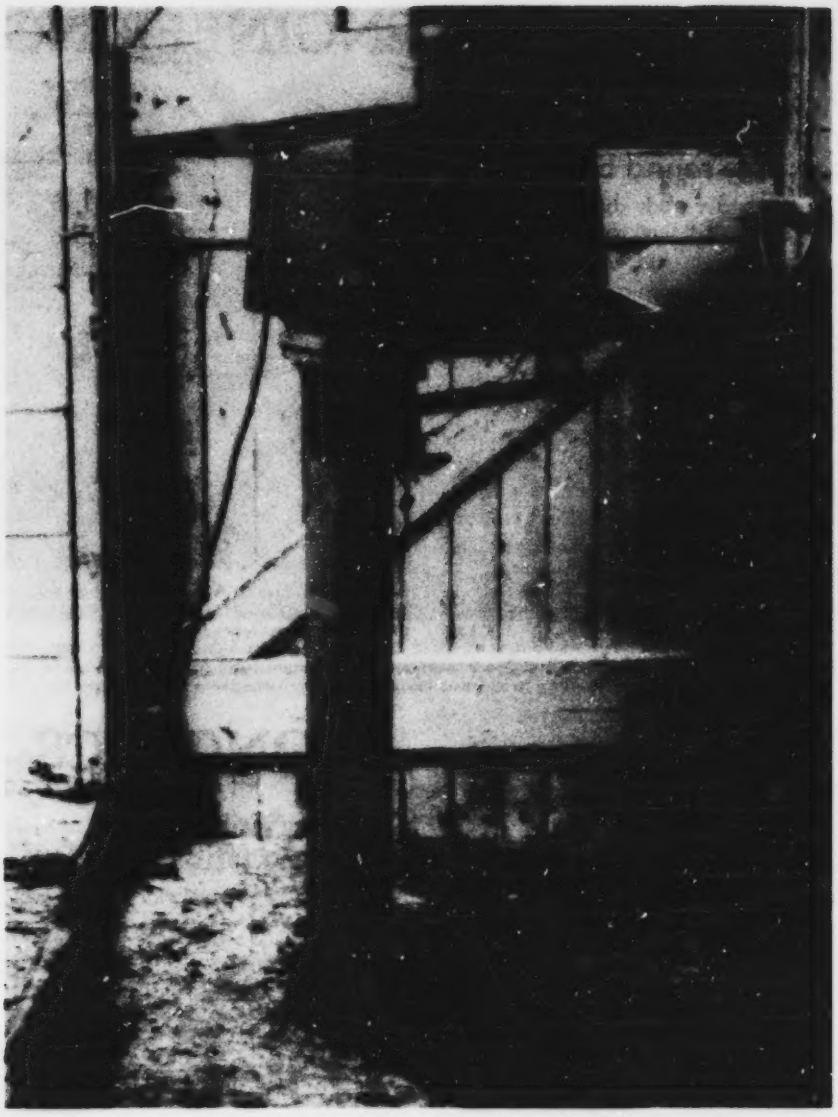
Ontario's apple industry

With sales of over $36 million, apples are Ontario's most important fruit crop. Although the area devoted to apple production has changed little in the past 15 years, the type of tree grown has changed dramatically. From 1971 to 1981, the number of standard trees declined by 27%, while the number of trees on size-controlling rootstock increased threefold. Sixty two percent of the apples marketed went for processing. In 1982, total costs for producing and harvesting apples (except marketing and storage) in the Georgian Bay region were $3,507 per hectare. In the Central Erie region, costs were $3,212 per hectare. The overall cost for four regions was $3,878 per hectare. EC

Analysis of Section 31 of tax law

Economists assessing the elimination of the $5,000 limit on tax losses for part time farmers have predicted that the change would increase the entry of individuals into part time farming. The elimination could be expected to increase the involvement in agriculture of non farmers to take advantage of tax deferral options, particularly for livestock feeding. The increased entry of non farmers would place upward pressure on land prices and increase competition for full time farmers.

UG



The on-farm microcomputer is potentially a very useful tool for the improvement of farm management. A recent survey indicated, however, that up to 75% of farmers owning computers was not making good use of them during the first year of ownership. Only 18% of respondents was using electronic spreadsheets. Those not owning computers expressed a need for more information before purchasing. Ridgetown College's Agricultural Microcomputing Newsletter, *with over 3,000 subscribers, provides a forum for impartial and informed investigation of currently available computers.*

INVENTORY OF AGRICULTURAL RESEARCH PROJECTS

The Inventory of Agricultural Research Projects contains all projects that were active during the fiscal year 1983-84. All research projects shown were funded in total or in part by the Ontario Ministry of Agriculture and Food. Projects at the University of Guelph are carried out under an agreement with the Ministry.

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AGRICULTURAL LABORATORY SERVICES

Provincial Pesticide Residue Testing Laboratory
Building 43, McGilvray Street, University of Guelph
Guelph, Ontario N1G 2W1 (519) 824-4120 ext. 2449

The Provincial Pesticide Residue Testing Laboratory is one of five branches of Agricultural Laboratory Services. The objective of PPRTL research is the improvement and amendment of pesticide registrations and recommendations in an attempt to reduce terminal residues to below the negligible level of 0.1 mg/kg whenever possible. The physical dispersal, chemical breakdown, and microbiological degradation of pesticides and toxic metabolites are monitored in order to set pre-harvest intervals for application. This research aids in our general understanding of the fate of pesticides in the environment and food.

Studies on the hazards of re-entry into treated areas, which include monitoring the absorption and excretion of pesticides by users, help minimize the risk factor in pesticide application. The development of pest control agents for minor hectarage crops, such as carrots, onions and celery, is particularly vital, as these crops do not generate the revenue that encourages chemical companies to conduct the necessary research.

PROJECT TITLE	RESEARCHER
ANIMAL PRODUCTION	
Fate of cypermethrin and fenvalerate used on dairy cattle to control insect pests	Frank, Braun
FIELD CROPS	
Monitoring flue-cured tobacco and soils on 34 farms for pesticide residues and metal contents	Frank, Braun, Elliot
Disappearance of metalaxyl in tobacco production	Ripley, Gayed
Terminal residues in canola, peanuts, and other crops from use of herbicides	Sirons
HORTICULTURAL CROPS	
Dissipation of pyrethroids from muck crops	Braun, McEwen, Frank
Dissipation of captan from strawberries and raspberries and removal by pickers	Frank, Braun, McEwen
Dissipation of insecticide residues from minor crops, carrots, onions	Frank, Braun, McEwen
Dissipation of captan from grapes and pome and stone fruit	Frank, Braun, Northover
Dissipation of dinocap and EBDC in cucumber fruit	Frank, Ripley, Jarvis, Slingsby, Fisher
Daminazole disappearance from apples	Lougheed, Ripley
Metalaxyl residues in potato production	Ripley
Disipation of fungicide residue from minor crops - celery, lettuce, strawberries	Ripley, McEwen
Monitoring Ontario grown fruit and vegetables for pesticide residues	Frank, Braun, Wheeler
Disappearance of acephate and its metabolites from vegetables producing roots, tubers, fruit, and leaves for consumption	Frank, Braun, McEwen
SOIL AND WATER MANAGEMENT	
Aminocarb dissipation following forestry use	Ripley, Nicholson
Degradation of triazines and acyl anilides in soils of different organic content and held at different temperatures	Frank, Sirons, Anderson
PEST MANAGEMENT AND DISEASE CONTROL	
Determining 2,4-D exposure of workers involving aircraft spraying operations through urine analysis	Frank, Siron, Campbell
Following the changes in organo-chlorine residues in Ontario residents over the decade	Frank, Braun
ENGINEERING	
Drum rinsing studies	Frank, Siron, Stripnieks
Use of capillary GLC in pesticide analysis	Ripley, Braun
Analytical method development for dicarboximide fungicides	Ripley
FOOD AND FOOD QUALITY	
Monitoring animal tissues for metal contents	Frank
Monitoring milk supplies in Ontario for pesticide residue	Frank, Braun, Sirons
Dissipation of diphenyl amine on stored apples	Ripley, Lougheed

CENTRALIA COLLEGE OF AGRICULTURAL TECHNOLOGY

Centralia College of Agricultural Technology
Huron Park, Ontario N0M 1Y0 (519) 227-4451

Centralia College of Agricultural Technology is set in the heart of mid-Western Ontario's diverse and productive agricultural community. College research reflects those crops unique to the area, such as white beans and rutabagas.

As part of the agronomy research programme, new developments in the production of rutabagas, white and coloured beans, soybeans (both for human and animal consumption), canola, winter rapeseed, and sunflowers are evaluated. New varieties are tested for yield potential and other traits, pesticide screening trials are conducted, and production practices such as row width, planting dates, crop rotations, and plowdown legumes are investigated. The data collected at CCAT are used to support new varieties for licensing and pesticide registration, and form the basis for Ministry production recommendations.

Farm business management studies are formulating a standard procedure and language for the recording and analysis of farm business records. This standardization should result in better understanding among farmers, accountants, lending institutions, and farm business advisers.

Centralia College has been conducting educational programmes since 1967. Two year diploma courses are offered in a variety of fields. In the fall of 1983, 329 full time students were registered. Approximately 1,500 people took part in 50 short courses, which were held on and off campus. Business courses in farm management were particularly popular.

PROJECT TITLE	RESEARCHER
FIELD CROPS	
Grain	
Evaluation of plowdown species in spring grain	Forrest
Weed control in corn	O'Toole
Protein and Oilseed	
Oil and protein crop variety trials	Forrest
Effect of crop rotations on white bean yields	O'Toole
White and kidney bean management	Forrest, O'Toole
Weed control	O'Toole
Soybeans	Forrest

PROJECT TITLE	RESEARCHER
HORTICULTURAL CROPS	
Vegetables	
Rutabaga management trials	O'Toole, Marshall
PEST MANAGEMENT AND DISEASE CONTROL	
Herbicide application systems	O'Toole
ECONOMICS	
Assessment of farming skills required by farm youths	Stephens
ENGINEERING	
Concrete tower silo coatings	Bellman
Poultry barn ventilation	Bird

ECONOMICS BRANCH

Economics Branch, Ontario Ministry of Agriculture and Food
4th Floor, 801 Bay Street, Toronto, Ontario M7A 2B2 (416) 965-1064

The Economics Branch is divided into two sections: Policy Coordination and the Economic Information unit.

Policy coordination is new to the Branch. At the request of the Minister and senior management officials, advisors assess the economic implications of policy alternatives. One of their research efforts is the creation and maintenance of a comprehensive data base for Ontario's processing, distribution, and retail (PDR) sector. Foreign agricultural policies and developments are watched closely to determine their effects on Ontario agriculture. The viability of similar developments in Canada is also assessed.

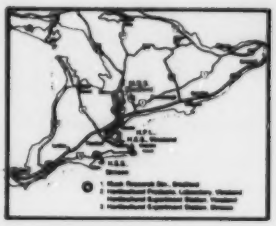
Other recent policy work has resulted in studies on tripartite stabilization, agribonds, and taxation as it affects small and part-time farmers.

The Economic Information unit monitors the efficiency of agricultural production through several channels. Farmers are surveyed for inventory, yield and price information, and the farm input sector is asked to supply current prices and future supply and price projections. Computer models on costs of production are maintained. Economists collate local information with international data to produce major commodity price and profitability forecasts. Provincial agricultural statistics are published annually.

PROJECT TITLE	RESEARCHER
ECONOMICS	
Estimated cost of growing white beans, 1982	Campbell
Farm enterprise cost estimating system	Lentz, Campbell
Strawberry production costs in Ontario	Buth, McKibbon
Economics of fresh-market tomato, cabbage and cauliflower production in Ontario, 1982	Fisher
Farm rental arrangements in Ontario, 1982	Fisher
Structural adjustment in Ontario's dairy processing industry	Caine
Apple production costs for standard and size-controlling trees, Ontario, 1982	McKibbon
Survey of pesticide use in Ontario, 1983	McGee
Beef feedlot cost study, southern and western Ontario, 1982	Abraham
A survey of custom farmwork rates charged in Ontario, 1983	Fisher
Beef feedlot cost study, southern and western Ontario, 1983	Fisher
Rural real estate prices in Ontario, 1980-82	Lentz

HORTICULTURAL RESEARCH INSTITUTE OF ONTARIO

Horticultural Research Institue of Ontario
Vineland Station, Ontario L0R 2E0 (416) 562-4141



Situated on some of Canada's prime horticultural land, the Horticultural Research Institute of Ontario is in an excellent position to align its many applied research programmes with the current needs of the province's fruit and vegetable industries. HRIO is actually four discrete units: its headquarters at the Horticultural Experiment Station at Vineland, the Horticultural Products Laboratory at Vineland, the Horticultural Experiment Station at Simcoe, and the Muck Research Station at Bradford. Although each of the stations specializes in given areas, many of their respective programmes share the broad policy objectives of import replacement through varietal, storage, and processing technologies, mechanized crop management to reduce labour costs, and energy conservation.

At the **HES Vineland**, attention is focussed on protected crops, tender and small fruits, tree fruits, and cross commodity studies in plant nutrition. Together with the nearby grape sub-station, Vineland occupies 90 hectares on soil that varies from ideal peach land to some suitable for grapes only. Specialists in protected crops – specifically, greenhouse vegetables, ornamentals, and mushrooms – are refining crop management and energy conservation methodologies to improve the economic viability of these industries. HRIO has the only mushroom research facility in Canada. As with all of HRIO programmes, individual projects are set in conjunction with industry priorities.

The fruit research programme, which is shared with HES Simcoe, is now developing crop management technology and cultivars that will replace imports with domestic fresh and processed fruit. Grapes, apricots, peaches, strawberries, raspberries, and blueberries have been targeted for import replacement. New to research on peaches and other tender fruit is the controlled environment of a .22 hectare double polyethylene greenhouse, known as a protected environment structure. A comprehensive soil management programme, which includes irrigation, mulching, and nutrient studies, is aimed at increased production and improved quality.

The breeding of sweet and sour cherries and Japanese and European plums is an integral part of the tree fruit programme, the goal of which is to provide Ontario growers with new cultivars and orchard management technology. Various rootstock and planting density trials for plums, cherries, and pears are in place to improve yields. Extensive nutrition and irrigation trials are also underway to reduce nutritional disorders and improve yield and quality.

At the **Horticultural Products Laboratory,** Vineland, investigations into the increasingly significant areas of storage, handling, processing, and quality of harvested fruits and vegetables are conducted. A major and continuing task is the evaluation of new cultivars from HRIO's plant breeders and those from other regions.

The storage research programme at HPL is designed to extend the marketable life of domestically produced vegetables and fruits. Approaches to storage technology under consideration include traditional cold storage, filacell, controlled atmosphere, and ultra-low oxygen. Current programme capabilities will be enhanced greatly upon completion of new facilities in the late fall of 1984.

Like storage research, the goal of processing research, which is closely integrated with HRIO breeding programmes, is import replacement. Research into process technology – a strawberry processing system to provide a competitive, frozen product is one example – has been given priority.

Ontario's vineyards occupy 33% of our fruit lands, and the grape crop constitutes 26% of the total farm value of all commercial fruits. As a research base for the province's grape and wine industry, much of HPL's work is dedicated to the improvement of wine quality and technology. At the joint request of the grape and wine industry, HPL is part of a cooperative programme to improve quality through the development of grape and wine standards. A juice programme for the production of new juice products from surplus commercial wine grapes has been launched. A study of the use of grape pigment as natural food colourants is well underway. This should provide growers with an entry point into world markets for the previously unused pigment.

The research programme at **HES Simcoe**, which is two thirds vegetables and one third fruit, reflects the production of the area it serves, the central Lake Erie counties. One of the original mandates of the station is the development of crops and technologies for the region's tobacco growers who wish to diversify. HES Simcoe is on the north shore, where sandy loam soil suits horticultural diversification. Particular emphasis is placed on field vegetables for processing and the development of total production systems for crops capable of being mechanized.

The tomato breeding programme at Simcoe focuses on greenhouse and field tomatoes and on tomato genetic research. HES scientists are developing greenhouse cultivars which can set fruit freely at a minimum night temperature of 13°C with little manual pollination. The cultivars being developed in field tomato breeding work demonstrate superior horticultural and processing qualities for hand and machine harvesting. The exploitation of useful genetic characteristics in non-adapted cultivars and wild species is the goal of genetic research.

The move towards increased mechanization characterizes cole crops and pickling cucumber research as well. Processing tomato management and physiology studies emphasize machine harvested, early maturing cultivars. Increasing pepper production, particularly locally grown transplants, is the objective of pepper research.

An important component of the small fruits programme is a scheme to revitalize Ontario's strawberry processing industry through the development of production systems favouring mechanical harvesting.

In Simcoe's laboratories, tissue culture technology is being used for the rapid propagation of virus-indexed seed potato plants to accelerate import replacement. Work at Simcoe has provided the technological basis for the establishment of the SPUD unit at New Liskeard. A rapid micro-propagation programme is in place for small fruits and their incorporation into the Ontario superior stocks scheme.

"Muck" or organic soils form when plant materials decompose in water. The major crops grown on muck soils are onion, carrot, lettuce, celery, parsnip, cauliflower, broccoli, and cabbage. In 1983, march grown vegetables had an estimated farm gate value of $39 million. The 3 hectare **Muck Research Station** at Bradford assists local growers of these and other muck crops through seed testing, herbicide and fungicide screening, and storage studies. Major emphasis is placed on finding disease and pest resistant cultivars and the setting up of cost effective spray schedules where necessary. MRS's crop management programme seeks to fine tune nutrition regimes, determine optimum plant spacings, improve temperature schedules for greenhouse crops, refine irrigation and water control technology, and generate information on protection from wind and water erosion. Soil management research is designed to minimize the subsidence of organic soil. Some storage and greenhouse work – relatively new extensions to production programmes – began recently.

Most of the province's horticultural crops have very high values, and continuous applied research is required to maintain those values. With a healthy horticultural industry, Ontario consumers can enjoy top quality produce and Ontario growers can expect reasonable returns.

PROJECT TITLE	RESEARCHER
HORTICULTURAL CROPS	
Greenhouse energy conservation	Ingratta, Blom
Fruit	
Development of improved strawberry cultivars for fresh market and processing	Dale
Effect of cultural and harvesting practices on productivity, profitability and mechanization in strawberry production	Dale
Management in small fruit crops	Dale
Coordinated small fruit trials in Ontario	Dale
Orchard management for the production of fresh market and processing apples	Elfving
Cold tolerance study of grapevines	Fisher
Training systems for grape cultivars	Fisher
Use of growth regulators	Fisher
Grapevine population studies in relation to yield and quality	Fisher
Vinifera cultivar and rootstock combination trial	Fisher
Grape rootstock experiments	Fisher
Apricot breeding and cultivar evaluation	Fisher
Breeding for wine and table grapes adapted to Ontario conditions	Fisher
Intensive peach production	Miles
Chemical thinning of peaches	Miles
Protection culture of fruit crops	Miles
Evaluation of prunus rootstocks for peach	Miles
Salt damage protection	Miles
Peach breeding and cultivar evaluation	Miles
Micro-propagation of small fruits	McKeown, Dale
The improvement of cranberry growing in Ontario	Smith
Breeding for early maturing European and Japanese plums and pollen compatability studies with plums	Tehrani
Rootstock studies with cherries	Tehrani

PROJECT TITLE	RESEARCHER
Breeding for a seasonal succession of firm-fleshed, non-cracking, self-fruitful, black sweet cherry cultivars and determination of incompatability of selection	Tehrani
Rootstock and management studies in plums	Tehrani
Rootstock and management studies in pears	Tehrani
Breeding sour cherry cultivars superior to Montmorency	Tehrani

Vegetables

Greenhouse tomato breeding	Courtney
Tomato genetics	Courtney
Field tomato breeding	Courtney
Vegetable cultural trials	Ingratta
Greenhouse vegetable crop management	Ingratta
The mushroom casing layer	Ingratta
Asparagus production and management	Loughton
Alternative crops for tobacco farms	Loughton
Cole crop production	Loughton
Seed potato management and physiology	McKeown
Procesing tomato management and physiology	McKeown
Potato production on sandy loam soils of the Central Erie counties	McKeown
Production practices for picking cucumbers	O'Sullivan
Influence of method of plant establishment and cultivars on yield and quality of peppers	O'Sullivan
Varietal differences in resistance to hortizontal lesions in carrots	Valk
Breeding and cultivar trials	Valk
Herbicide studies with muck crops	Valk

Ornamentals

Greenhouse floriculture management	Blom
Environmental adaptation of ornamental plants	vacant
Propagation of woody ornamental plants	vacant
Rhododendron breeding	vacant
Container nursery stock production	vacant
Holly breeding	vacant

PROJECT TITLE	RESEARCHER
Edible nut production and propagation	vacant

SOIL AND WATER MANAGEMENT

Fertilizer and soil management studies with grapes	Cline, Reissmann
Fertilizer and soil management studies with apples	Cline, Reissmann
Soil management and fertilizer studies with peach	Cline, Reissmann
Trickle irrigation studies for horticultural crops	Cline, Reissmann
Evaluation and development analytical methods for determining the nutrient status of plant material	Cline, Reissmann
Soil management for highbush blueberry production	Cline, Dale

PEST MANAGEMENT AND DISEASE CONTROL

Herbicides for weed control in various horticultural crops	O'Sullivan

FOOD AND FOOD QUALITY

Storage and maturity studies and quality evaluation of fruits and vegetables	Chudyk
Evaluation of new grape cultivars for wine production	Chudyk, Gray
Freezing of horticultural products	Chudyk
Development of quality standards for commercial grapes	Chudyk
Microbiology of horticultural products	Chudyk
Investigation of new techniques and cultivars in the development of potentially useful product from fruits and vegetables	Fuleki
Evaluation of the processed quality of fruit and vegetable cultivars	Gray
Methodology of testing and training sensory evaluation panels	Gray
Development of appropriate methods for the sensory evaluation of fresh, stored and processed horticultural commodities	Gray
Post harvest studies on fruit including storage and marketing of small fruit, stone fruit, pome fruit and grapes	Smith
Post harvest studies on vegetables including storage and marketing	Smith

PROJECT TITLE	RESEARCHER
Celery storage trials	Valk
Colour and quality improvement of wines in relation to chemical constituents and changes	Fuleki
Recovery of useful constituents from grape pomace and other fruit and vegetable processing plant waste materials	Fuleki
The chemistry of ripening and colour development in relation to optimum quality of fruits, vegetables and their products	Fuleki

KEMPTVILLE COLLEGE OF AGRICULTURAL TECHNOLOGY

Kemptville College of Agricultural Technology
Kemptville, Ontario K0G 1J0
(613) 258-3411

Eastern Ontario, traditionally an area of livestock and forage crops, is fast developing strengths in new fields, soybeans and blueberries being two examples. This diversification has to a great extent been stimulated by research and demonstration work at Kemptville College of Agricultural Technology, through cultivar selections and production recommendations tailor made to the region's conditions.

Home to approximately 30% of the province's dairy cattle, the East enjoys milk sales valued at $250 million annually. To ensure the continued efficiency of area producers, KCAT dairy research takes a comprehensive approach: calf nutrition and health studies, the development of diets for high production from lactating dairy cows, and trials to improve the growth and stature of replacement heifers. As a result of KCAT veal research, many producers are feeding surplus skim milk to male dairy calves. Work in the heavy calf programme and feeding trials continues.

With present low beef prices, beef researchers are exploring the feasibility of using locally produced feeds. Growth promotants, diet supplements, and improvements in feedlot health are also being investigated.

Although corn continues to be the mainstay of crop production, research is making soybeans a viable alternative to livestock feed production for some area farmers. KCAT agronomists continue to provide Ontario's research committees with variety and management data from corn, soybeans, cereal, and forage production trials. The College also generates regional recommendations on soil management and weed control.

Recently Kemptville assumed a new task: to expand Eastern Ontario's horticultural industry. In the search for new crops, variety trials for fruit and vegetable crops are conducted. The promotion of local strawberry production has already met with success. A greater supply of lowbush blueberry plants at KCAT and further information on seedling lines, fertilizer recommendations, and vegetative propagation should strengthen this burgeoning industry. Maple syrup research – KCAT has the province's sole research bush – is aimed at improvements in syrup quality and energy conservation.

Food service technology projects support other research through quality assessment, particularly of fruit, vegetables, and cereals. Taste panels on meat from veal calves are also conducted.

Kemptville College, which was founded in 1917, offers both a 2 year diploma programme and a wide range of continuing education courses to complement its research efforts. In the fall of 1983, 319 full time diploma students registered. More than 3,300 people registered in extension courses. The College occupies 325 hectares at Kemptville and 19 at Winchester.

ANIMAL PRODUCTION

Forage: grain ratios in cattle feeding through the growing and finishing periods	Hooper
Group early weaning of holstein calves	Drevjany
Supplementation of a skim milk diet with tallow emulsified with activated linseed meal	Drevjany
Increasing the proportion of grain in the complete ration for fresh cows	Wheeler
Further evaluations of least-cost formulations for cattle feeding based on data generated in the 1982-83 trial involving forage: grain ratios	Hooper
A comparison of two implants utilizing yearling steers on corn silage based diets	Hooper

FIELD CROPS

Grain

Cereal variety project	Hoekstra
Corn variety project	Hoekstra
Corn fertility project	Curnoe
Corn management project	Hoekstra
Cereal herbicide project	MacDonald
Corn herbicide project	MacDonald

Forage

Forage fertility project	Curnoe
Forage management project	Madill
Forage variety project	Madill
Forage herbicide project	MacDonald

PROJECT TITLE	RESEARCHER
Protein and Oilseed	
Oilseed management project	Madill
Oilseed variety project	Madill
Oilseed herbicide project	MacDonald

HORTICULTURAL CROPS

Fruit	
Blueberry cultural practices	Ingratta
Small fruit variety trials	Ingratta
Tree fruit variety rootstock trials	Ingratta
Vegetables	
Vegetable variety trials for Eastern Ontario (part A-potatoes, tomatoes, peppers)	Langenberg
Vegetable variety trials for Eastern Ontario (part B-cole crops)	Langenberg
Growing of fresh market tomatoes on various dates and under different cultural practices	Langenberg

PROJECT TITLE	RESEARCHER
Maple	
Maple syrup production	Langenberg
Sterilization of maple sap by ultra-violet irradiation	Langenberg

ENGINEERING

Evaluation of pea harvest equipment	Stone

FOOD AND FOOD QUALITY

Recipe development for milk-fed veal	Johnson
New product development – replacement of rice with hull-less oats	Johnson
Sensory evaluation of white veal on energy-supplemented fluid skim milk diets	Johnson
Sensory evaluation of strawberry varieties	Johnson

NEW LISKEARD COLLEGE OF AGRICULTURAL TECHNOLOGY

New Liskeard College of Agricultural Technology
New Liskeard, Ontario, P0J 1P0 (705) 647-6701

New Liskeard College of Agricultural Technology sits on the southern edge of the "little clay belt", an area of exceptionally rich clay soil. Temperatures are ideal for the growth of forages, cereal grains, and small oilseeds, and do not hinder livestock production in any way. In the past 15 years, agricultural production in the North has grown steadily, as evidenced by its transition from the deficit to surplus production of livestock feed grains. The availability of early maturing varieties, management recommendations, tile drainage, and informed growers are given credit for this expansion.

NLCAT's agronomy research programme assists northern growers by developing regional recommendations for field and horticultural crops production. Cultivar testing for forage grasses and legumes (especially alfalfa), cereal grains (mainly oats and barley), oilseeds, corn, and cool season cole crops form the basis for grower variety selection and for licensing. Production research involves developing recommendations for fertility, plant density and row spacings, tillage practices, and harvesting methods. Research takes place at both the plot and field scale and an expanded programme of pasture research has been initiated. Seed production research in forages and the production of pre elite seed potatoes are aimed at capitalizing on Northern Ontario's unique advantage of low disease incidence due to cooler temperatures.

NLCAT's livestock research, which includes beef and dairy cattle, sheep and swine, refines feeding and management guidelines for the region's producers. Recent beef studies are showing the feasibility of finishing cattle in the North, using locally grown feeds. Similarly, feeding research for dairy cattle and swine aims at making optimum use of local feeds. NLCAT is home to Ontario's sole sheep research flock. In order to gain a larger share of the lamb market, research is underway to determine the most cost effective method of sheep-raising for producers' operations. This involves comparing pasture and confinement management systems, lamb finishing trials, and reproduction studies involving heat synchronization and artificial insemination.

Since 1970, New Liskeard College has been offering a unique 2-year diploma course to help fill the need for full-time farmers and agribusiness people in the North. A two-week modular system means that a wide range of specialists can be brought to NLCAT to conduct intensive courses for both full and part time students. Enrolment has risen 20% over the past 4 years to a total of 78 students in the fall of 1983. Forty-five students were registered in extension courses. The Northern Ontario Agricultural Resource Centre (NOARC), established in 1981 at NLCAT, disseminates information on northern farming conditions.

ANIMAL PRODUCTION

Beef	
Performance of beef steers on formic acid treated haylage vs wilted silage with various levels of concentrate	Pollock
Red veal production	Pollock
Sheep	
Estrus synchronization in sheep	Dupchak
Finishing of lambs to two different weights on pasture versus confinement feeding	Dupchak

PROJECT TITLE	RESEARCHER
The use of chlortetracycline hydrochloride in lamb creep feed	Dupchak

FIELD CROPS

Grain

Weed control in cereals and other crops	Skepasts
The development of early inbred lines of corn for the future use of hybrid production for Northern Ontario	Skepasts
Regional oat and barley test	Skepasts
Cereal cultivar project	Skepasts
Intensive barley production	Skepasts, Rowsell

Forage

Silage corn performance test	Skepasts
Effects of potassium carbonate applications on alfalfa	Pollock
Forage cultivar evaluation project	Skepasts
The effect of time of application of certain rates of nitrogen on dry matter production of bromegrass	Skepasts

Protein and Oilseed

Cooperative field pea tests	Skepasts
Nitrogen fertilization of canola in Northeastern Ontario	Rowsell
Oil crop cultivar evaluation project	Skepasts

HORTICULTURAL CROPS

The evaluation of cole crop cultivars planting dates and planting methods for Northern Ontario	Hughes
Sweet corn planting date test	Hughes
The development of an industry based cultivated medicinal and other herbs in Northern Ontario	Hughes

SOIL AND WATER MANAGEMENT

Tillage requirements for fine textured Northern Ontario soils	Skepasts, Rowsell

PEST MANAGEMENT AND DISEASE CONTROL

Evaluation of fusilade and related herbicides	Skepasts

RIDGETOWN COLLEGE OF AGRICULTURAL TECHNOLOGY

Ridgetown College of Agricultural Technology
Ridgetown, Ontario N0P 2C0 (519) 674-5456

Southwestern Ontario is an agriculturally intensive region, home to one third of the province's total agricultural production. It has the highest heat unit range in Canada, a favourable climate, and a broad selection of fertile soils. For over 60 years, research programmes have been conducted at Ridgetown – first as the Western Ontario Experimental Farm (1922), later as Ridgetown College of Agricultural Technology (1968) – programmes that have reflected and facilitated the growth of the agricultural industry in the Southwest.

The swine programme has traditionally been the mainstay of livestock research at RCAT. Swine researchers seek to develop feeding and management strategies that will make for an efficient conversion of domestic feedstuffs into lean pork and to extend knowledge of swine nutrition and management to producers. The breeding herd of 20 sows supplies uniform crossbred market pigs for research purposes and exemplifies the benefits of proper herd management practices. Beef research is designed to optimize the dietary protein level in fast growing exotic crossbred steers, to evaluate the efficiency of growth promotants, and to augment cow fertility. Dairy research, although limited at this time, is currently assessing the effect of feeding and management techniques on the reproductive efficiency of dairy cows with superior milking ability. The 36 purebred Holsteins are the highest producing herd in Kent County.

As 60% of the region's farmland is planted to soybeans, corn, and winter wheat, grower access to superior field crop varieties and regional production guidelines is essential. Accordingly, cereal, perennial forage and grass legume, field bean, and soybean cultivars, as well as corn hybrids, are evaluated for licensing and monitored for recommendations in on and off campus trials. Their performances under a wide array of production techniques are monitored for recommendation purposes. Recently a large soybean programme was established at RCAT with testing sites at 4 locations.

The mandate of Ridgetown's horticultural programme is to develop production methods that will result in economical crop management. Research efforts include the testing of Ontario tomato and pepper breeding lines, cole crop studies, the development of plant establishment methodologies, and the evaluation of tender fruit cultivars for regional adaptability and hardiness. Fruit research continues to expand in step with grower interest, as evidenced by a new vineyard of vinifera grapes at Cedar Springs.

Agricultural engineering studies emphasize the modification of existing structures and operating procedures on area farms. Researchers are also working on drying and storage criteria for a low temperature corn drying system, cooling systems for the summer operation of swine barns, and the effects of various cultivation and tillage practices on energy requirements and water usage.

RCAT's weed control programme seeks to improve systems to control the broadest spectrum of weeds as economically as possible with reasonable crop safety and minimal disruption to the environment. The insects and diseases programme develops strategies for improved pesticide application systems, cultivar resistance, and the screening of candidate chemicals and adjurants to combat costly area pests like the variegated cut worm and European corn borer.

The College's extensive soils research programme accentuates the development and use of economically and ecologically sound soil management practices. Conservation studies include work with windbreaks and tillage practices to halt soil depletion caused by wind and monocropping. Maximum yield potential trials for corn and soybeans are underway in research plots, and comprehensive fertilizer application trials continue to generate guidelines for efficient use. RCAT chemists are pinpointing micronutrient deficiencies in Southwestern Ontario's crops to ensure growers make informed purchases of costly soil additives.

Farm economists at Ridgetown tailor their research to local needs by developing and refining financial and record keeping techniques so that they can be adopted readily by farmers. The use of computers is now an important part of their work.

RCAT's education programme grew out of the Western Ontario Agricultural School, which was established in 1951. Today, RCAT offers 2 year diplomas, with an increasing number of specialized courses to meet present and future needs of the region's ever more sophisticated and diversified agribusiness. In 1983, 408 full time students were enrolled. Extension programmes attracted over 7,000 people and included management of farm business courses, commodity days, seminars, and Farmers' Week.

PROJECT TITLE	RESEARCHER
ANIMAL PRODUCTION	
Beef	
Development of intensive management programs for beef cows	Luckham
Growth rate and feed efficiency improvers for feedlot cattle	Vander Wielen
Dairy	
Feeding program for lactating cows	Vander Wielen
Swine	
Feeding programs for growing pigs	Morris
Management systems for swine	Morris
Swine structures and environment	Morris
Specific swine industry problems	Morris
FIELD CROPS	
Grain	
Tissue analysis for nutrient content as affected by various fertilizer practices (nitrogen and phosphoros)	Brimner
Tissue analysis for nutrient content as affected by various fertilizer practices	Johnston
Calcium and magnesium in crop production from the use of agricultural limestone	Johnston
Cereal varieties and management	Smid
Hybrid evaluation for grain and forage	McLaren
Production studies in grain corn	McLaren
Forage	
Forage varieties and management	McLaren
Protein and Oilseed	
Evaluation of soybean cultivars	Ablett
Cultural studies in soybeans	Ablett
Evaluation of field bean types and cultivars	Ablett
Cultural studies in field beans	Ablett
Evaluation of chick peas and pigeon peas and black gram as potential crops in Ontario	Ablett
HORTICULTURAL CROPS	
Fruit	
Performance and hardiness testing of tender fruit, grapes, and apple varieties in Kent County	Muehmer
Vegetables	
Cultivar testing and evaluation of processing and greenhouse tomatoes	Muehmer
Cultural and management studies in processing tomatoes under Southwestern Ontario conditions	Muehmer
Breeding, cultivar testing and management studies with processing peppers	Muehmer
Cultivar testing and management studies of various vegetable crops in greenhouses	Muehmer
Cultivar testing and management studies with cole crops and other small acreage crops	Muehmer
SOIL AND WATER MANAGEMENT	
Soil test calibration research with soybeans	Stevenson
Maximum yield research with soybeans	Stevenson
Soil test calibration - field beans	Baldwin
Tillage and fertility studies on corn	Baldwin
Nitrogen and nitrification inhibitor research with corn	Stevenson
Corn and legume interseeding	Baldwin
Shelterbelt protection and corn growth and yield	Baldwin
Maximum yield research with corn	Stevenson

PROJECT TITLE	RESEARCHER
Phosphorus and potassium soil test calibration research with corn	Stevenson
Nitrogen and N-serve research with winter wheat	Stevenson

WASTE MANAGEMENT

Composted sewage sludge on corn	Baldwin

PEST MANAGEMENT AND DISEASE CONTROL

Effect of herbicides on weed control and crop response in beans	Swanton
Effect of herbicides on weed control and crop response in cereals and alfalfa	Swanton
Herbicides for control of specific weeds	Swanton
Effect of herbicides on weed control and corn yield with and without weed escapes	Brown
Effect of herbicides on weed control and crop response in vegetable crops transplanted and field seeded tomatoes, peppers, asparagus and red beets	Brown
Studies in the control and biology of velvetleaf (abution threophrasti) and quackgrass	Brown
Effect of herbicides on weed control and crop response in vegetable crops	Swanton
Soil insect control in field corn	Pitblado
Insect control in horticultural crops	Pitblado
Foliar insect control in field crops	Pitblado
Pesticide application techniques in horticultural crops	Pitblado
Seedling decay and root rots in field crops	Pitblado
Foliar disease control in field crops	Pitblado
Disease control in horticultural crops	Pitblado
Insects and disease control in field tomatoes	Pitblado

ECONOMICS

Weed losses study	Beattie
Analysis of marketing strategies for Ontario producers of corn and soybeans	Doidge
Analysis of land pricing and leasing	Ross
Potential for computer use on the farm	Ross
Software development for on farm computers	Ross
Farm financial management	Beattie
Analysis of farm production systems	Beattie

ENGINEERING

Monitoring energy efficiency of low temperature drying (corn)	Underwood
Automatic control of ventilation air inlets	Sojak
Heat exchangers for livestock housing	Sojak
Cooling of ventilation air	Sojak

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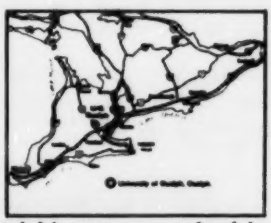

For over a century, the Ontario Agricultural College and the Ontario Veterinary College, and more recently other colleges of the University of Guelph, have been conducting research programmes on behalf of the Ontario Ministry of Agriculture and Food. In that time, the nature of these programmes has changed and the scope has broadened dramatically. New disciplines, such as environmental biology and energy management, have taken their place alongside traditional ones, such as animal husbandry and horticulture. Since the first demonstration trials at the original farm on what is now Guelph's campus, much of the research has moved out onto the Ministry's five experimental farms. These research stations, which are operated by the University, include: Arkell (swine, poultry, engineering, environmental biology); Cambridge (horticultural crops, turf management, pest management); Elora (beef, dairy, field crops, soils); Guelph (feed production); and Woodstock (field crops). The priorities of each of Guelph's research programmes, followed by titles of current projects within each programme, are provided below.

The Ontario Agricultural College has been offering Ministry-funded diploma programmes since 1874; in the fall of 1983, there were 389 full time students registered. Through the Independent Study programme, the only programme of its kind in Canada, diploma courses are also offered by correspondence. Last year, over 4,000 students participated. Courses in extension education take the forms of workshops, symposia, and conferences. There are over 20 annual events, such as Poultry Industry and Bankers Schools, as well as one-time courses in, for example, canola production and meat processing for inspectors.

ANIMAL PRODUCTION

Beef

Present marketing conditions make it crucial that beef operations be run with maximum efficiency and minimal health-related losses. Accordingly, beef research at Guelph seeks to develop breeding, feeding, and management programmes that will improve the efficiency of lean beef production, and so enable producers to select beef systems for increased productivity and profit. To answer immediate needs, studies are underway to define more closely nutrient requirements of feedlot cattle, to examine the efficacy of growth implants and feed additives, and to enhance the value of forage based feeds. Some basic research work is in progress on the genetic feed efficiency in cows.

To improve the health of highly productive livestock, veterinary scientists are evaluating the stresses of modern husbandry systems, as well as vaccine preventive programmes and new epidemiological techniques for health monitoring. To reduce the disparity beween the number of beef cows bred and the number of calves born (and weaned), a wide range of reproduction studies are underway. Respiratory diseases of feedlot cattle continue to be serious problems for producers, so that research in housing and management in this area continues to have priority.

PROJECT TITLE	RESEARCHER
Pharmacological studies of hypersensitivity, inflammation and associated homeostatic mechanisms in domestic ruminants, with particular reference to pulmonary diseases	Eyre, Norris, Elmes, Mirbahar, Perron, Autenried, Bakunzi, Alexander, Cheung
Correlative light microscopy (LM), scanning electron microscopy (SEM) and transmission electron microscopy (TEM) of muscular dystrophies	Geissinger, Becker, Knipe
Factors associated with disease, death and productivity in feeder cattle following entry into the feedlot	Martin, Meek, Rosendal, Curtis, Prescott, Barnum, Johnson
Comparison of bovine interopathogenic E coli and porcine atypical interopathogenic E coli	Gyles, Harnett
The pathophysiology of fibrinous pneumonia in cattle	Maxie, Lumsden, Valli, Eyre, Carriere
Studies on the spread of H somnus in a naturally infected cow-calf herd	Little, Barnum, Thorsen, Humphrey, Glover
Experimental propagation of bovine ocular squamous cell carcinoma within the coelomic cavity of the bovine	Baird, Livesey, Rostkowski
Research into the clinical application of the use of xylazine reversing agents	Pascoe, Curtis, Sandals, Leslie, Etherington, Bateman
The transfer of immunoglobulins in association with placental pathology in cattle and sheep	Miller, Poitras
The significance of high serum bilirubin values in cattle	McSherry, Lumsden, Baird
Efficiency of paratect bolus (morantel tartrate) in cattle against gastrointestinal parasites	Slocombe, Leslie
The effect of anthelmintic treatment on weight gain of steers entering an Ontario feedlot	Blackwell, Sandals, Curtis, McCraw, Slocombe
Relationship of elevated creatine phosphokinase levels to mortality in sick cattle admitted to OVC	McSherry, Valli, Lumsden
To develop a system of monitoring chloramphenicol in slaughtered calves	Mitchell, Feltmate
Crossbreeding programs for beef production on a dairy farm	Burnside, Wilton, Pfeiffer, Rozzi
Corn silage studies. Value of nitrogenous additives and agronomic and eniling consideration that affect nutritive value	Buchanan-Smith
The role of carcass composition on meat quality in beef cattle	Jones, Wilton, Buchanan-Smith, Rompala, Haworth, Gullett
Improving beef cattle testing programs	Schaeffer, Wilton
Growth promotants for livestock	Burgess, Jones, Etches
The effect of feedlot reception procedures on feeder calf performance	Burgess, Curtis, Buchanan-Smith
Investigation of factors affecting fertility in beef cows	King, Walton
Characteristics of donors and recipients influencing the efficiency of beef production through embryo transfer	Wilton, Reid, Walton, Leslie
Grain mycotoxins in diets of ruminants	Young, McGirr, Lumsden, Valli, Grieve, Moran

PROJECT TITLE	RESEARCHER
The effect of nutrition on the acute pulmonary edema and emphysema induced by 3-methylindole	Bray, Kubow, Kirkland
Effect of salinomycin on performance of feedlot cattle	Macleod
Comparison of methods of measuring feed efficiency	Allen, Wilton, McMillan
Interaction of forages in rumen digestion	Buchanan-Smith, Mowat, Macleod, Forsberg, Ndlovu
Growth promotants for beef cattle	Mowat, Jones, Richards
Nutritional evaluation of residue from methane fermentation of animal wastes	Mowat, Buchanan-Smith, Macleod, Jones, Lee
Protein requirements of large-framed growthy feedlot cattle	Macleod, Buchanan-Smith, Jones
Breed X castration interactions in the feedlot	Jones, Burgess, Wilton
Effect of breed and plane of nutrition on calf performance and reproduction in the cow	Wilton, Macleod, King
Growth and carcass characteristics of large, late-fattening steers on different feeding systems	Jones, Buchanan-Smith, Wilton, Burton, Rompala
Systems of utilizing crop residues for feed	Mowat, Ganesh
The economic importance of cow size and milk yield	Wilton, Jones
The production of beef using culled cows	Jones, Macleod
The effect of nutrition on the detoxification ability of ruminants in relation to their drug metabolizing enzyme system	Bray, Burley
Systems of producing leaner beef	Mowat, Forster
Effect of lasalocid sodium on feedlot performance of beef steers	Macleod, Buchanan-Smith

Dairy

Ontario's dairy cattle are among the best in the world. Nevertheless, a high level of research is required for our dairy producers to remain competitive through increased biological and economic productivity. Priority is given to finding more accurate procedures for identifying superior genetic stock, to developing feeding systems for the ever increasing nutrient requirements of higher producing cows, and to increasing reproductive efficiency.

With the needs of larger dairy operations in mind, researchers are developing efficient computerized health maintenance records. Work continues in traditional areas of concern, such as neonatal calf diarrhea and respiratory diseases. Infectious diseases which reduce performance potential and therapeutic and prophylactic measures for a wide spectrum of illnesses are being studied.

A pharmacological study of cutaneous vasculature in the calf	Eyre, Eghianruwa
An investigation into the nature, prevalence and significance of congenital factor XI deficiency in cattle	Gentry, Black
The effect of experimental P13 and P haemolytica infection on neutrophil function in the calf	Lumsden, Maxie, Valli, Carriere
To study the toxicology of topically applied organophosphates in the bovine	Black
Inherited keratogenesis imperfecta in Holstein calves (baldy calf syndrome)	Basrur, Venkatarayappa
Effectiveness of intraesophageal medication and feeding in young calves	Chapman, Butler
Development of the procedures for electron microscopy of animal tissues collected for light microscopy	Yamashiro, Geissinger
The effect of GNRH and/or prostaglandin on the early post partum dairy cow	Etherington, Bosu, Doig, Martin, Cote, Leslie
Platelet and prostaglandin involvement in allergic/inflammation reactions of bovine lung	Lotz, Eyre
Improved methods for detecting BVD infection and immunity in cattle using the ELISA technique	Lang, Savan
Total and differential somatic cell counting in milk for the control of bovine mastitis	Barnum, Meek
The flora and sensitivity pattern of microorganisms in bovine semen in Ontario	Fish, Rosendal
Control of the infectious agents causing bovine mastitis	Barnum, Meek, Vizmanos, Brooks
Monitoring disease and production in dairy cattle pilot project based on milk analysis and recording of clinical disease	Martin, Meek, Dohoo
Angitens and antibodies of importance in brucellosis in cattle	Tizard
Identification and antimicrobial susceptibility of anaerobic bacteria in chronic pneumonic conditions in cattle	Prescott, Chirino-Trejo

PROJECT TITLE	RESEARCHER
The prevention of infection with bovine leukemia virus by specific immunization	Valli, Derbyshire, Tizard, Hollinshead, Miller, Stirtzinger, Hayes
Study of the effects of ethionine induced fatty liver on biotransformation processes in the liver	Black, Boermans
Respiratory function studies in cattle with respiratory disease and relationship to milking performance	McDonnell, Gallivan, Baird
A study of metabolic diseases in dairy cattle	Baird, McKinnon, Lumsden, Butler
Study of the effect of fatty liver on drug and toxin biotransformation in dairy cows	Black, Boermans
Bronchopulmonary exfoliated cells in the diagnosis of bovine respiratory diseases	Singh, Sanderson, Spinato
Cattle twinning and intersex development – a model of freemartinism	Raeside
Development of bovine lung organ culture techniques to study pathogenesis of bovine pasteurellosis	Johnson, Wilkie
Study of pulsatile release of prostaglandin F2a (PGF2a) in the cyclic cow	Liptrap, Vigho
A study of the prevalence of staph aureus and other staphylococci as causative agents in chronic bovine mastitis and a comparison of single versus double dry cow treatment for elimination of these infections	Leslie, Barnum, Bateman
Evaluation of serum gamma-glutamyl transferase as an indicator of colostrum intake in newborn calves	Baird, Johnson, Lumsden
Biochemical and clinical evaluation of oral electrolyte formulations in neonatal calf diarrhea	Baird, Gyles, Hamilton, Pegrum
The effects of uterine infections on luteal function in the bovine	Bosu, Ross
Detection of E coli enterotoxin in the feces of calves with E coli diarrhea	Gyles, Araya-Sanchez
Studies on enterotoxigenic E coli diarrhea in colostrum fed calves. Part V efficacy of current treatment regimes	Butler, Gyles, Wilson
Investigations into control of ureaplasma contamination in bovine semen	Bosu, Ruhnke
Monocyte kinetics in normal and pneumonic calves	Maxie, Al-Izzi, Johnson, Valli, Wilkie

PROJECT TITLE	RESEARCHER
Development of a vaccine against salmonella typhimurium in cattle	Gyles, Butler, Clarke
Retained placenta and delayed uterine involution. The role of PG and progesterone	Bosu, Liptrap, Leslie, Etherington
A study of the development of maleness in fetuses: testicular development and leydig cell population dynamics	Fisher, Vandelod
Dermal-epidermal interactions in health and disease	Hardy Fallding, Brown, Goldberg
Nutritive value of alfalfa silage	Buchanan-Smith, Campbell
Measurement of estrone sulphate in milk as a method for early confirmation of pregnancy in cows	Raeside, Walton, Bosu
Crossbreeding programs for beef production on a dairy farm	Burnside, Wilton, Pfeiffer, Rozzi
Relationship between external rump measurements and calving difficulties in Canadian dairy cattle	Burnside, Schaeffer
The relationship among current management systems, production, disease and drug usage in dairy and swine herds	Wilson, Britney, Butler, Hacker, Martin, McMillan, Meek, Stone, Swaminathan
Development of an automated system of measuring milking speed in dairy cows	Burnside, Schaeffer, McClelland
Comparison of several linear models for use in dairy cattle sire evaluation	Schaeffer, Kennedy
Evaluation of Holstein-Friesian A1 sires for stillbirths and ease of calving	Burnside, Schaeffer, Cady, Freeman
Protein nutrition of dairy heifers	Grieve, Burton, Bagg
The relationship between the motor activity and production of dairy cows	Hurnik, Hammell
The effects of plant and fish protein in preruminant calf diets on growth, health and immunological parameters	Burton, Srihara
Interrelationships of dietary and digestive factors by ruminants	Macleod, Burton, Young, Grovum, Colucci
Grain mycotoxins in diets of ruminants	Young, McGirr, Lumsden, Valli, Grieve, Moran
Influence of prepartum feeding and body condition on feed intake, milk production and health in early lactation	Grieve, Macleod, Curtis, Lumsden, Boisclair

PROJECT TITLE	RESEARCHER
A quantitative study of factors affecting the expression of estrous behaviour by dairy cows	Walton, King
Genetic and environmental causes of immunoglobulin levels in Canadian dairy cattle	Burton, Burnside, Wilkie, Robertson, Srihara
The role of estrogenic compounds in the etiology of milk fever	Bray, Draper
Effects of selection and population structure on genetic variation and accuracy of genetic evaluation of dairy cattle	Kennedy, Sorensen
The role of B-carotene in the fertility of dairy cattle maintained in a confined environment	Stone, Walton, Buchanan-Smith, Akordor
Effect of ration protein degradability on lactation response	Grieve, Buchanan-Smith, Macleod, Bowman
Effect of sodium hydroxide treatment of protein on digestion	Macleod, Buchanan-Smith, Schell
Blended complete diets for dairy cattle in conventional housing	Stone, Grieve, McMillan, Sinnott
Control of ovarian function in dairy cows during early lactation	Walton
Development of a test for the diagnosis of early pregnancy in cows	Walton
The influence of light pulses on bovine lactation	Hacker, Perera
Production systems – feeding management of the dairy cow and its influence on disease, drug use and production	Stone, Britney, Grieve, Meek, Martin, Williams
The effect of buffers on protein nutrition of ruminants	Buchanan-Smith, Grieve, McMillan, Grovum, Okeke
Voluntary intake of shredded newsprint by dairy cattle	Grieve, Burton
Effect of ration protein degradability on lactation response	Grieve, Macleod, Buchanan-Smith
Anomalous milks – correction for chain length in infrared milk analysis	Van de Voort
Protein-energy interrelationships in rations of first lactation cows	Macleod, Grieve, McMillan
Meeting protein requirements of young ruminants	Macleod, Buchanan-Smith, Grieve, Myhr
Effects of dairy heifer calf sickness on future productivity performance	Britney, Martin, Clark, Stone, McMillan, Burnside, Curtis
Feeding value of moist corn gluten feed for dairy cows	Macleod, Grieve
Comparison of on-farm and central laboratory testing for butterfat	Kennedy, Burnside, Schwartz
Effect of low-temperature cleaning on microbiological quality of raw milk and cleanliness of milking equipment	Stone, Myhr
Bovaid ear tags for fly control in dairy cattle	McMillan, Burton, Surgeoner
The effect of plant population per acre of corn for whole plant silage to be fed as the sole roughage for lactating dairy cows	Grieve, Stone, Buchanan-Smith, Hunter
The effect of prolactin suppression on milk yield, hormone levels and ovarian function in dairy cows during early lactation	Walton, Vorstermans, King, Etches, Raeside
Retained placenta and delayed uterine involution: the role of PG and progesterone	Bosu, Liptrap, Leslie, Etherington

Swine

The high quality of Ontario pork is known world wide. Swine exports, both of pork products and breeding stock, contribute significantly to Canada's balance of trade. Persistent efforts directed toward improved production efficiency are essential in order to ensure hog producers a fair return, provide consumers with quality pork products, and expand export markets. Scientists are studying means of improving reproduction efficiency, feed utilization, genetic evaluation programmes, and carcass quality. They are also identifying and regulating environmental factors that influence pig wellbeing. Basic research is being conducted on muscle biology and its implications for meat quality, the primary nutrient requirements of piglets, and the dynamics of pig populations under genetic selection.

In recent years, there has been much emphasis on herd health. A comprehensive project charting the relationship of management practices and drugs to productivity, which includes computerized monitoring of management and swine health, is nearing completion.

Correlative uterine microscopy and plasma steroid levels in lactating sows and sows with experimentally induced cystic ovaries	Geissinger, Rhodes
Development and function of steroid biosynthesis in the fetal testes of the pig	Raeside
Intrinsic arteries of the porcine hypophysis cerebrii	Whiteford
An investigation of the influence of circulating levels of steroid hormones on the coagulation profile of domestic animals	Gentry, Liptrap

PROJECT TITLE	RESEARCHER
Determination of plasma levels of steroid hormones, with emphasis on steroid sulphates and on a local transport system for androgens in the boar	Raeside
A survey of selenium and vitamin E levels in feed and body tissues of pigs on Ontario farms	Friendship
Morphological analysis of liver from the pigs fed various types of fat	Singh, Yamashiro
Correlates of morphologic studies in normal and experimentally altered parathyroid gland with ozone inhalation autoimmune mechanism, angiogenesis, etc.	Atwal, Peksingh
Incidence and anatomical description of birth defects in swine	Partlow, Fisher, Barrales
Detection of carrier state of porcine stress syndrome (PSS)	Basrur, Frombach
Tissue residues in normal and diseased animals following chloramphenicol treatment	Black, Nelson, Campbell, Eyre, Barnum
Interrelationship of progesterone and prostaglandin F2a in the metritis-mastitis-agalactia (MMA) syndrome in post-parturient sows	Liptrap
Steroid biosynthesis in the testes of the boar	Raeside, Liptrap
The immunogenicity of the polypeptides of porcine parvovirus	Derbyshire, Lynch
A study of vascular stress in swine	Downie
Pleuropneumonia of pigs caused by haemophilus pleuropneumoniae	Rosendal, Lombin, Mitchell, Gilbride, Wilson
Antibody-dependent cell-mediated cytotoxicity (ADCC) and natural killer (NK) cell activity in porcine transmissible gastroenteritis (TGE)	Derbyshire, Cepica
Response of young pigs to immunization against common swine pathogens	Miniats, Carpenter
An abattoir survey of pneumonia in Ontario swine	Wilson, Takov, Friendship
Histochemical and morphometric studies on stress-susceptible pigs	Hulland
Evaluation of ultrasonic regnosticators	Bosu, King, Wilson, Almond
Pathogenesis of mycotoxins in domestic animals	Gentry
Mathematical model of oxytetracycline residues in swine tissues	Black, Gentry
Serotype associated virulence factors in porcine salmonellosis	Wilcock

PROJECT TITLE	RESEARCHER
Heuristic swine production and management model	Wilson, Pieper, Friendship, McMillan, Hacker, Pfeiffer
A survey of drug use on Ontario swine farms	Wilson, Friendship, Pieper, McMillan, Hacker
Development of an enzyme-linked immunosorbent assay (ELISA) for the diagnosis of transmissible gastroenteritis (TGE) in swine	Derbyshire, White
Stimulation of NK cell activity in the newborn piglet	Derbyshire, Loewen
Intestinal disorders: pathogenesis of acute viral diarrhea using TGE of piglets as a model: intestinal glucose transport	Butler, Hamilton, Rodyakers
Mechanism of cystic ovary development in the sow	Liptrap, Peter
Escherichia coli enterotoxin plasmid mutants as vaccines	Gyles
Hormonal and pathological aspects of porcine parvovirus in pregnant sows	Liptrap, Meyers
Control of LH and testosterone in the pig	Liptrap
Evaluation of ultrasonic pregnosticators	Bosu, King, Wilson, Almond
The effects of anti-inflammatory drugs on uterine motility and force of contraction	Harris
The effects of pentacholrophenol (PCP) residues in animal bedding on the skin of young pigs	Fallding, Brown
A study of the development of maleness in fetuses: testicular development and leydig cell population dynamics	Fisher, Vandelod
Dermal-epidermal interactions in health and disease	Hardy Fallding, Brown, Goldberg
Initiation of estrus in sows and gilts	King, Walton
Endocrine regulation of ovarian function in sows	Walton
Ingestive behaviour of neonatal piglets	Hurnik, Morrison, Fiala
The relationship among current management systems, production, disease and drug usage in dairy and swine herds	Wilson, Britney, Butler, Hacker, Martin, McMillan, Meek, Stone, Swaminathan
Triticale in diets of pigs	Young, Poysa, Reinbergs
Grain mycotoxins in diets of pigs	Young, King, Lumsden, Valli, Moran, Walton

PROJECT TITLE	RESEARCHER
Causes, detection and amelioration of meat with abnormally high or low PH	Swatland
Genetic improvement of swine through performance records and artificial insemination	Kennedy
Determination of the effects of exercise on the performance of the sow and piglets	Hacker, MacLachlan
The effect of environment on the absorption of immunoglobulins by the newborn piglet	Hacker, Bate
The influence of group vs individual penning on behaviour, feed conversion, soundness, growth and puberty in pigs	Kennedy, Hacker, Darcy, Joyal
Nutrition and management of pigs for reproduction	Young, King, Walton
Evaluation of floor type and pig density	Ogilvie, Pattie
Effect of dietary fat on mineral retention of pigs	Leeson
Energy metabolism in young pigs	Bayley
Use of rapeseed (canola) meal in baby pig diets	Bayley
Conditioned interval feeding in swine	Hurnik, Hammell
Effect of diet on alleviation of toxic effects and tissue residues of fusarium mycotoxins in swine	Smith, Stangroom
Prediction of carcass yield and quality in market hogs	Jones, Hacker
Implication of alternative marketing strategies for the pork industry	Bowman, James

Poultry

The goal of the poultry programme is to fine tune the present technologies used in our meat and egg producing industries. In response to the changing needs of the meat market, such as the increased popularity of cut up and deboned chicken, researchers are studying the nutritional and genetic factors affecting carcass composition in broiler chickens and turkeys. Studies on sexual development in leghorn and broiler breeders are aimed at defining optimum environments to control pullet development and maturation. To comply with producer concerns about bird welfare, ethological studies are being made of the bird's social environment. Basic research allows scientists to understand better the characteristics of the avian system, such as rate of hormonal and photoperiod effects on ovulation, and primary nutrient requirements of all classes of poultry.

Health research aims at the reduction and elimination of the incidence and severity of those diseases having the greatest effect on present productivity and profitability levels. The control of zoonotic disease is of greatest concern at present.

Toxic effects of methyl mercury on the reproductive organs of domestic chickens and ducks	Bhatnagar, Blachandran
Egg yolk protein synthesis in poultry	Gibbins
Ultrastructural studies on the liver of domestic avian species. I establishment of normal morphometric parameters. II hepatotoxicity of methylmercury	Bhatnagar, Vrablic, Yamashiro
An epidemiology study of factors in poultry and their products associated with specific abnormal flavour and taste	Fish
Host-parasite interaction in the coccidia – pathogenetic mechanisms involved in the disease caused by coccidial parasites	Fernando
The immune response of turkeys to hemorrhagic enteritis virus (HEV)	Thorsen
Turkey production without anticoccidial drugs	Julian, Lee
Control of salmonella contamination of poultry	Barnum, Mitchell, Anderson, Reid
A study of the ELISA test for serodiagnosis of avian encephalomyelitis and turkey herpesvirus infections	Lang, Lwin
Investigation into the causes of production drops, failure to peak, and poor egg production in chicken flocks	Julian, Ferguson, Lang, Joyce
An investigation of a paramyxobirus enzootic in breeding turkeys, of its role in production problems and of possible means for control or eradication of the viruses	Lang
Infectious bursal disease virus infection of turkeys	Thorsen, Chui
Iodide metabolism and the transference of minerals to the oocytes and embryos of poultry	Robinson, Gibbins
Estrogen-induced vitellogenesis in poultry	Gibbins
Application of the enzyme-linked immunosorbent assay to the investigation of avian infectious bronchitis virus infection in Ontario	Thorsen, Zellen
The nerve-muscle relationship in the leg of normal broiler chickens	Partlow
Investigation into health problems of Ontario turkey breeding enterprises caused by sporadic and enzootic myxovirus infections	Lang

PROJECT TITLE	RESEARCHER
The pathogenesis of and immune response to paramyxovirus-3 infection of turkeys	Thorsen
Rapid serodiagnosis of infectious tenosynovitis infection of chickens by enzyme-linked immunosorbent assay (ELISA)	Thorsen
Efficacy of antibiotics, growth promotants and coccidiostats for poultry	Leeson
Nutrient requirements of growing pullets and laying hens	Summers
Protein evaluation	Summers
The control of ovulation in domestic birds	Etches
Carcass composition of commercial broilers	Friars, Irwin, Hart
Significance of finish on the turkey carcass to its cooking characteristics and yields	Moran
Breeding program for genetic stocks maintained in small populations	Reinhart, Hurnik
Factors influencing the hatchability of eggs from commercial sources	Reinhart, Moran, Hurnik
Factors affecting feed efficiency in the laying hen	Morrison
Pilot studies of index selection progress	Frairs, McKay, McLeod, Hart
Toenail clipping turkeys as a means to reduce undergrades	Moran
Meat yields and composition of various kinds of poultry	Orr, Hunt
Nutrition and management of meat turkeys to improve their commercial value	Moran
Feeding breeder turkeys to maximize performance and minimize fat	Moran, Ferket
Studies on lameness and leg problems in broiler chickens and turkeys	Julian, Ferguson, Summers, Leeson
Poultry egg production curves	McMillan
Behaviour of hens in battery cages	Hurnik, Webster
Nutrition and management of the pullet	Leeson
Development of feeding systems for poultry	Leeson
Strain, strain cross, and age effects on profits in producing eggs	Friars
Growing chicken broilers in cages	Walker
Strain differences in nutrient requirements of poultry	Leeson

Sheep and Goats

Research at Guelph is aimed at identifying and controlling those diseases deemed economically significant by the province's expanding sheep and goat industries. Thus far, the control of enterotoxemia type D in both sheep and goats, and caseous lymphadenitis and respiratory infections in goats, has been given priority.

PROJECT TITLE	RESEARCHER
Studies on enterotoxemia in goats: experimental production of enterotoxemia in the mature goat	Butler, Blackwell, Prescott, Chapman
Stimulation of protective immunity against corynebacterium pseudotuberculosis	Gyles, Muckle
3-methylindole-induced pulmonary edema and metabolic basis of prolonged pulmonary disease in ruminants	Atwal
The control of food intake and gastro-intestinal functions in sheep – a model ruminant	Grovum, Chapman
Metabolic and morphologic basis of pulmonary alveolar-capillary permeability and detoxification of metabolites in domestic ruminants	Atwal
Analysis of variables in ecdysis, growth and development of immature strongylata. I haemonchus contortus. II strongylus vulgaris	Slocombe, Clarke
Neutrophil function in sheep experimentally infected with bovine lymphosarcoma virus and in cattle with clinical evidence of tumor	Walker, Valli, Johnson, Lumsden, McSherry, Stirtzinger
The epidemiology and etiology of spontaneous nasal adenocarcinoma in sheep	Valli, Thorsen, McKinnon, Stirtzinger, Hayes
Studies on enterotoxemia in goats systemic immune response and local inflammatory reaction to vaccination with a bacterin-toxoid vaccine containing clostridrium perfrigens C and D.	Butler, Bell, Blackwell
Immune response to chlamydia psittaci infection in sheep	Shewen
Toxic effects of mycoplasmas and mycoplasma fractions	Rosendal, Valdivieso-Garcia
Interaction of parasitic and microbiological agents in pneumonia of goats and sheep	McCraw, Rosendal, Goltz
Investigation of a vaccine for the prevention of caseous lymphadenitis (field trial)	Barker

PROJECT TITLE	RESEARCHER
Superovulation and ovum transfer in goats	Bosu, Stubbings, Barker, King
Experimental enterotoxemia (clostridium perfringens type D infection) in the mature goat	Chapman, Butler, Prescott, Blackwell
The effects of different feeding and management factors on blood flow to the brain and rumino-reticular motility	Graham

Bees

Current honeybee research concentrates on increasing honey production in Ontario by improving bees and nectar sources. Through a programme of selection, breeding, and evaluation, bees with superior performance under Ontario conditions – showing, for example, the ability to collect nectar and pollen at colder than normal temperatures early in the day or in the season – are being identified. Selections of alfalfa and rapeseed are being screened for high nectar production for use in the development of new varieties that will secrete more nectar, attract larger numbers of pollinators and, as a result, have the potential for improved pollination and seed yields. The long term effects on colony populations exposed to sublethal amounts of insecticides are also under investigation.

Physiological indices of nectar potential in forage legumes	Shuel
Selection for high nectar potential in alfalfa and birdsfoot trefoil	Shuel
Selection of honey bee strains for improved foraging under Ontario conditions	Smith, Milne
Secretion of systemic insecticides in nectar and their effect on honeybee colonies	Shuel, Davis
Selection for high nectar potential in some agricultural honey plants	Shuel
Selection for ease of tripping and high nectar in alfalfa	Shuel

Fish

Guelph's fish production programme supports research on the nutritional needs and disease susceptibility of fish raised in captivity, particularly rainbow trout. Its objective is to boost the productivity and profit margins of Ontario's commercial trout farms. To do this, researchers are determining the basic nutrient requirements of trout and how various environmental conditions affect these requirements. Applied research is underway on the formulation and processing of commercial diets to produce more cost efficient feeds. Fish diseases are currently monitored throughout the province, and research is soon to be conducted on the immune system, the development of vaccines, and the etiology of bacterial gill, the most common of fish diseases.

Studies on carbohydrate as an energy source in trout diets	Atkinson, Hilton, Slinger
Interrelationship of vitamins with other nutrients in diets for Rainbow Trout	Hilton, Slinger
Mineral requirement studies in Rainbow Trout	Hilton
Riboflavin supplementation of practical diets for Rainbow Trout and methods of assessing riboflavin status in the trout	Woodward
The effect of vomitoxin on young Rainbow Trout fed a practical-type diet	Woodward, Young
Bacterial gill disease in Rainbow Trout	Ferguson, Goldes
The pantothenic acid requirement of Rainbow Trout fry and fingerlings	Woodward, Cho
The pyridoxine requirement of Rainbow Trout fry and fingerlings	Woodward
The effect of PH and starvation on reticuloendothelial clearance in Rainbow Trout	Ferguson

Other

Mink is by far the most economically significant fur bearing animal raised in Ontario. Accordingly, the mandate of the fur bearing animal programme at Guelph is to obtain basic information on the normal reproduction and mortality rate of commercially produced mink, in order to assess areas of economic concern to the industry. Research has also taken aim at various infectious diseases, namely Pseudomonas aeruginosa pneumonia and enteritis caused by Campylobacter jejuni. In response to producer concerns, veterinarians also take part in a monitoring programme to help eradicate Aleutian disease.

Effects of steroid hormones on skeletal muscle in tissue culture	Geissinger, Yamashiro
SDA: an important coponavirus infection in the rat	Percy
The pathogenesis and prevention of corynebacterium equi infection	Johnson, Zink
A pilot survey of pasteurella serotypes present in rabbits in Ontario	Percy, Prescott
Surveillance of diseases in laboratory animals	Percy
Simultaneous assessment of heart and respiratory rates and gait in racing, performance and working horses	Willoughby, Grinyer, Loosley-Millman, Schnurr

PROJECT TITLE	RESEARCHER
Wildlife disease surveillance	Barker, Julian
Assessment of cardiac function in the horse showing limited exercise tolerance utilizing the techniques of vectorcardiology and computer analyses	Physick-Sheard
Hypophyseal intermediate lobe colloid – a transport system	Boyd
Ultrastructural examination of the liver, testis and thyroid of rats treated with photomirex or mirex	Singh
The peroxisome: a freeze-fracture study	Singh
Placental transfer and teratogenic characteristics of selected chemicals found in the Great Lakes basin	Black
Surveillance of parasitic diseases of domesticated animals in Ontario	Slocombe
Brown adipose tissue: a physiological and morphological study	Harris, Yamashiro, Moore
Experimental oncology	Valli, Patterson, Norris, Stirtzinger
Investigation of canine humoral and cell mediated immune response following intestinal or parenteral administration of modified live, inactivated or sub unit rabies vaccine	Wilkie, Derbyshire, Depauli
Aleutian disease in mink	Wilkie, Wright, Prescott
Strongylids in equine biology, pathogenesis and control I. strongylus vulgaris	Slocombe, McCraw
"Tying-up" syndrome in horses – a pathological study of clinically affected animals	Hulland, McEwen
Host resistance to pasteurella haemolytica	Wilkie, Shewen
Campylobacter jejuni infections	Prescott
To prepare and develop a vaccine for prevention of strangles	Barnum, Srivastava
Platelet function in domestic animals: physiological and pathological variations	Johnstone
Nephrotoxicity of methylmercury in domestic and wild waterfowl	Bhatnagar, Snelgrove-Marsh
Placental transfer and teratogenic characteristics of selected chemicals found in the Great Lakes Basin	Black
Transmission and pathogenesis of haemoproteus infection in muscovy ducks	Julian
Corynebacterium equi infections in foals	Prescot, Johnson
Clinical quantitation of chronic obstructive pulmonary disease in the horse	Valli, McDonell, Thorsen, Eyre, Willoughby, Viel
The role of the fetus in the hormonal regulation of gestation in the horse	Raeside, Liptrap, Milne, Gofton
Pseudomonas vaccination in mink	Hunter, Prescott
A study of the development of maleness in fetuses: testicular development and leydig cell population dynamics	Fisher, Vandeloo
Antidotal properties of B-D-thioglucose on acute cadmium and thallium toxicity	Eyre, Wozniak
Dermal-epidermal interactions in health and disease	Hardy Fallding, Brown, Goldberg

FIELD CROPS

Grain

Improving Ontario's grain cropping technologies for use in livestock and cash crop enterprises is the goal of cereals research. Breeding populations, germplasm lines, and cultivars are tested for yield, quality, and lodging and disease resistance. Through cooperative testing programmes, the adaptability of new selections to Ontario conditions and the potential of new crops, such as winter triticale and hard red winter wheat, are tried out. New emphasis has been placed on performance testing of hybrid corn for whole plant silage. Developments in breeding methodology and the relative importance of various components on yield and adaptability are being studied to improve selection criteria for breeding programmes. Reasons for differential performance of cultivars and hybrids under different environments and soil components are being investigated. Management techniques, especially for intensive cereal production, are being developed.

Production studies on barley and oats	Gamble	Cytogenetic studies in cereals	Kasha, Reinbergs, Hunt, Falk
Evaluation of the potential of breeding corns for whole-plant corn silage	Hunter	Quality and yield of corn silage	Daynard, Jofriet, Buchanan-Smith
Ear mold and mycotoxins in corn	Hunter, Den Boer	Inter-plant competition in corn	Daynard
Development and evaluation of corn breeding techniques	Kannenberg, Hunter	Quality in Ontario grain corn	Daynard

PROJECT TITLE	RESEARCHER
Genotypic and environmental effects on grain filling and grain maturity in corn	Daynard, Reddy, Castro, Baron, Bagnara
Crop improvement through plant cell and tissue culture	Kasha, Kott, Anderson, Ellis, Peterson, Ziauddin, Karavinashetti
Testing new improved varieties of cereals	Hunt, Reinbergs, Smid, Hoechstra, Burrows, Skepast, Ho, Sampson, Teich
Evaluation of corn hybrids	Kannenberg, Hunter
Development and improvement of corn breeding populations and inbreds	Kannenberg, Hunter
Haploid production and utilization in cereals	Kasha, Reinbergs, Kott, Wheatley, Marolais, Deslauriers
Identification and breeding of forage legume conservation crops	Bowley, McKersie, Clark, Hunter
Winterhardiness of winter cereals	McKersie, Hunt, Reinbergs, Hallem
Aerobic stability of high moisture grain corn	McKersie
Breeding new and improved varieties of winter and spring wheats	Hunt, Migus, Vander Poorten, Aguilar
Breeding improved varieties of spring barley	Reinbergs, Kasha, Anderson, Edgington
Breeding improved varieties of winter barley	Reinbergs, Smid
Breeding improved varieties of oats	Reinbergs, Anderson, Burrows
Triticale in diets of pigs	Young, Poysa, Reinbergs
Effects of crop sequence on soil structure, stability, and productivity	Daynard, Ketcheson, de St. Remy, Vyn
Effect of tillage practices on soil properties and the growth and yield of corn	Ketcheson, Vyn, Daynard, Lee
Breeding improved varieties of winter triticale	Reinbergs, Young, Poysa, Smid, Skepasts, Hoekstra
Nitrogen requirements for whole plant corn silage grown at high plant densities	Hunter, Beauchamp
The effect of plant population per acre of corn for whole plant silage to be fed as the sole roughage for lactating dairy cows	Grieve, Stone, Buchanan-Smith, Hunter

Forage

Forage crops are grown to provide feed for the dairy and beef industries and to improve soil structure and fertility. When considered as a livestock feed, the goal of the forage programme is to increase livestock production per unit area of land. Through the development of superior cultivars and the modification of management practices, researchers hope to increase and stabilize forage production.

Because of new varieties and changes in fertility and harvesting practices, forage mixtures are being re-evaluated. Crop scientists are also considering the role of new species and agronomic practices in pasture production and soil conservation. Basic research continues on the physiology and genetics of the plant.

Forage quality determination	Winch
Application of tissue culture technology to forage legumes	Kasha, Kott, Swanson, Orshinsky, Ellis, Peterson
Seed production studies in birdsfoot trefoil and perennial ryegrass	Gamble
The relationship of autumn managements to persistence and succeeding yield in perennial forages	Fulkerson
Alfalfa-breeding for pest resistance	Christie, Papadopoulos
Selection for forage yield in grasses	Christie
Reducing seed pod shatter in birdsfoot trefoil	Bowley, Kasha
Selection for seedling vigour, competitiveness, and seed yield in birdsfoot trefoil	Bowley, Christie
Selection for winter-hardiness and longevity in alfalfa	Christie
Selection for digestibility and and protein in forages	Christie, Teeteh
Selection for yield per se in alfalfa	Christie
Forage cultivar evaluation	Christie, Bowley
Methods of hay preservation	Fulkerson
Evaluation of forage crops and production practices	Fulkerson
Forage seed production studies	Fulkerson
Identification and breeding of forage legume conservation crops	Bowley, McKersie, Clark, Hunter
Selection of alfalfa for maximum yield in shorter rotations	Bowley, Christie

PROJECT TITLE	RESEARCHER
Winterhardiness of perennial forages	McKersie, Illman
Protein degradation in ensiled alfalfa forage	McKersie, Buchanan-Smith
Evaluation of factors contributing to seedling vigour and establishment of birdsfoot trefoil	McKersie
Use of near infrared spectroscopy for estimating the quality of forages	Winch
Evaluation of forages for use in pasture systems	Winch
Pasture systems	Winch, Macleod
A legume ideotype for grain crop sod-seeding	Clark, Christie, Bowley
Decomposition of incorporated forage legumes	Clark, Vyn
Screening forage legumes for domesticated animals in Ontario	McKersie, Havarro
Methods for evaluating seed quality in forage legumes	McKersie, Tomes

Protein and Oilseed

In the last 20 years, the use of protein and oilseed crops as sources of energy and protein for both animals and humans has become widespread. Research on these crops, particularly soybeans, canola, white beans, and peanuts, aims at improved production efficiency. Breeding programmes in all four crops are designed to increase yields while maintaining or improving quality. Variety testing, which includes mustards and flax as well, provides data to support licensing of superior lines and provides the basis for variety recommendations. Management studies with soybeans, canola, and white beans yield results that help guide farmers towards best combinations of crop management for maximum returns. The research programme combines basic and applied research, ranging from applied biotechnology to field scale cooperative research with growers.

Whitebean breeding and evaluation	Beversdorf, Hume
Seed vigour of soybeans and its relationship to seedling emergence, stand establishment and yield	Gamble, Males, Said, Jones, Peppard
Management systems for winter rape	Hume, Beversdorf
Testing and management of spring oilseeds	Hume, Beversdorf
Improving nitrogen fixation in soybeans	Hume, Beversdorf, Winter
Improving nitrogen fixation in white beans	Hume, Beversdorf, Smith, Moxley
Cold tolerance in soybeans	Hume, Beversdorf
Photosynthetic rates and yield differences in triazine-tolerant and susceptible brassica SPP	Hume, Beversdorf
Early soybean breeding and evaluation	Beversdorf, Hume
New management systems for field bean production	Beversdorf, Hume, Rennie
Effects of genotype and environment on quality aspects of soybeans and rapeseed	Beversdorf, Hume, Cramer, Weiss-Lerman
Spring rapeseed breeding and evaluation	Beversdorf, Hume, Weiss-Lerman, Erickson
Winter rapeseed breeding and evaluation	Beversdorf, Hume, Enerson
Peanut breeding	Michaels, Tanner, Hough
An evaluation of the economic feasibility of irrigating peanuts in Southern Ontario	Stonehouse, Roy, Clark
Peanut harvesting and curing	Tanner, White, Bilanski, Roy

HORTICULTURAL CROPS

Fruit

Guelph's fruit programme focuses on the maturity and post harvest physiology of tree fruits and related management practices, and on the breeding and management of strawberries and raspberries. Through management, maturity, and post harvest studies, horticulturists can assess the effect of various chemicals on the storage quality of apples, provide recommendations for controlled atmosphere storage of apple cultivars, and make possible accurate predictions of harvest dates.

Strawberry breeding and management work is providing the industry with cultivars that extend the fresh market season and that fulfill the demands of mechanical harvesting and processing. Raspberry breeding and management studies also provide industry with new cultivars, ones suitable for both pick-your-own operations and mechanical pruning.

Strawberry breeding	Evans, Van Schyndel
Raspberry breeding	Evans, Van Schyndel
Responses of fruit crops to environmental factors	Ormrod
Effect of pre-harvest and post-harvest factors upon the physiology and regulation of fruit ripening	Murr, Lougheed
Maturity studies of Ontario apples	Lougheed, Proctor

PROJECT TITLE	RESEARCHER
Production techniques for tree fruits, particularly apple	Proctor, Lougheed
Raspberry management	Evans, Dale
Raspberry management	Evans

Vegetables

Cultural studies are underway to improve seed quality in potatoes, modify cultural practices for increased asparagus yields, and use reject heat as an energy source for greenhouse tomato production. Nutritional studies are also being conducted with cauliflower, greenhouse tomatoes, and lettuce. The development of improved potatoes, rutabagas, and asparagus cultivars is another important task of vegetable research at Guelph.

The vegetable programme includes fundamental studies in modifying environmental and physiological factors affecting plant growth in order to improve the photosynthetic activity of horticultural plants. An important element at this time is the assessment of cultivar tolerance to atmospheric pollutants and the development of strategies to reduce or eliminate the influence of these pollutants on plants.

Factors influencing the incidence of black speck in cauliflower curds	Riekels
Influence of storage environment on potato quality study. III Seed quality and sprouting	Zitnak
Cultural studies with field and greenhouse vegetables	Tiessen
Plastic mulch trials	Tiessen
Responses of vegetable crops to environmental factors	Ormrod
Potato production practices for Ontario	Rowberry
Breeding of rutabagas and asparagus	Harney, Nonnecke, Tiessen, Rotondo, Ziemborska
Glycoalkaloids as a quality factor in potatoes. III Chaconine in common potato cultivars	Zitnak
Breeding and evaluating potato varieties for Ontario	Coffin
Asparagus variety improvement and cultural practices	Tiessen, Harney, Peterson, Slimon, Desjardins, Rotondo, Butler, Khosla
The incorporation of vegetable seeding technology into direct seeding programs of Black Spruce reforestation	Riekels
Magnesium nutrition of greenhouse vegetables	Riekels
Rutabaga seed production	Nonnecke, Harney, Kramp

Ornamentals

Horticulturists seek to ensure producers and consumers broad selection and high quality in ornamentals, chiefly through cultivar development and improvements in production techniques. To keep Ontario growers competitive, a concerted effort is underway to develop and assess cultural practices that reduce energy and labour requirements in crop production, maximize plant productivity, and extend the storage life of cut flowers. The use of Ontario grown herbaceous and woody ornamentals in indoor landscaping is being promoted. Stresses caused by air and soil pollutants and other environmental factors are being assessed, so that appropriate corrective practices can be formulated.

Responses of ornamental crops to environmental factors	Ormrod
Physiology of cutflowers as influenced by environment prior to, during and after storage	Murr, Tsujita, Lougheed
Breeding and mass in vitro propagation of flowering ornamentals	Harney, Nonnecke, Hildebrandt, Smith
Renovation of turf areas	Eggens, Wright
The growth, culture and control of annual bluegrass	Eggens, McTear, Wright
Competitive ability of turfgrasses	Eggens, Wright
Turfgrasses species and cultivar evaluation	Eggens, Wright
Field production, handling and performance of nursery stock	Lumis, Witherspoon, Johnson
Container growing woody plants	Lumis, Johnson
High intensity lighting and commercial flower production	Tsujita, Butt
Nutritional studies of greenhouse crops	Tsujita
Energy conservation in greenhouse flower production by environmental manipulation	Tsujita
Soil management for turfgrass production	Sheard
Integrating greenhouse control of lighting, CO_2 and temperature for increased plant productivity	Grodzinski
The use of herbaceous perennials in Ontario	Grodzinski

SOIL AND WATER MANAGEMENT

Soil management research has the dual goal of increasing crop yields and maintaining or improving soil structure. To this end, priority is given to developing soil test calibrations, making efficient use of nitrogen, and developing crop alternatives and tillage systems that improve organic matter and reduce erosion.

Water management research is necessary to maintain the quality of water used for agricultural purposes and to ensure that the requirements of agricultural production are compatible with environmental concerns. Research is underway to refine control measures which safeguard groundwater quality, to reduce nutrient and soil runoff, and to quantify the impact of agricultural activities, especially land drainage, on the amount and timing of streamflow.

The aims of the agrometeorology programme are to help farmers take advantage of climatic opportunities and combat climatic adversities, whenever possible, and to generate fundamental knowledge of the way crop plants respond to atmospheric and soil environments. Much of the research is interdisciplinary. Several projects are in place, including one to assess the potential for increasing corn yields by irrigation.

PROJECT TITLE	RESEARCHER
Application of trajectory simulation modeling to agricultural problems	Thurtell, Kidd
Observation, compilation and analysis of current and past weather records	Brown, Gillespie, King, Kidd
Development of an electronic weather-monitoring device for pest management	Gillespie, Kidd
Assessment of the potential for increasing yields of field corn with irrigation	Brown
Relating ozone injury to dose and rate of 03 uptake by plants	Gillespie, Thurtell, Amiro, Kidd
Effect of tillage and residue management on surface movement of soil and water	Ketcheson, Vyn
Nitrogen requirements for whole-plant corn silage grown at high plant densities	Hunter, Beauchamp
Methods to evaluate the effects of pesticides in the aquatic ecosystem	Solomon, Kaushik, Robinson, Yoo, Day, Lungle, Herrera, Herman
Determination of sediment contributing areas	Dickinson, Pall
Transport, transformation and properties of organic carbon in streams draining agricultural land	Kaushik, Robinson, Bird, Rachar, Herrera
Determination of soil erodibility	Dickinson, Pall
Remedial strategies for controlling sediment transport	Dickinson, Pall
The effect of agricultural activities on groundwater quality	Robinson, Whiteley
Effect of tillage and residue management on surface movement of soil and water	Ketcheson, Vyn
Availability of manure nitrogen	Beauchamp, Lovcanin, Bryant
Response of corn to nitrogen on Ontario soils	Beauchamp, Lovcanin, Bryant
Nitrification inhibitor with preplant nitrogen fertilizer application on winter wheat	Beauchamp, Hunt, Sutton, Lovcanin, Bryant
The relationship of soil organic matter to the physical properties of soil	Thomas
Drainage benefit	Irwin
Subsidence of organic soil	Irwin
Effect of freezing and thawing on soil physical properties	Kay, Groenevelt
Forage systems as nitrogen sources in crop production	Sheard
Interaction of soil drainage, species and plant nutrition	Sheard
Phosphorus and potassium requirements for alfalfa production	Sheard
Effects of crop sequence on soil structure, stability, and productivity	Daynard, Ketcheson, de St. Remy, Vyn
Soil factors limiting corn yield in Ontario	Miller
Effect of tillage practices on soil properties and the growth and yield of corn	Ketcheson, Vyn, Daynard, Lee
Assessment of the potential for increasing yields of field corn with irrigation	Brown
Effect of soil structure and tilth on crop growth	Ketcheson, Kay
Winter application of manure on alfalfa	Sheard
Development and evaluation methods for prediction of macro and micronutrient requirements of crops	Bates
Volatilization of ammonia from applied urea	Beauchamp, Sheard, Thurtell, Kidd
Water and chemical transport in soils	Elrick

WASTE MANAGEMENT

The energy content of many agricultural residues is high and can be recovered by a variety of means. Waste management research seeks to expand the usefulness of these residues by adapting digesters for methane production from manure and by determining the usefulness of manure in crop production. Better manure handling systems are being designed to provide greater return on energy and capital expenditures. Researchers are also studying different microorganisms for the rapid breakdown of crop residues or for increased digestibility of such residue for livestock.

PROJECT TITLE	RESEARCHER
Degradation of cellulose and the conversion of cellulosic wastes to feeds by mixed cultures of micro-organisms	Smith
Microprocessor control in fermentation	Meiering
Nutrient recovery from food processing effluents with microbial biomass	Meiering, Gregory, Stevens
Evaluation of alternative manure-handling systems on the basis of efficient use and retention of energy and economic viability	Stonehouse, Kelland, Ogilvie, Pos, Mowat, Robinson, Beauchamp, Lane, Lohr
Methane gas production from animal manure	Pos, Porringa, Harvey, Bollen
The distribution of plant nutrients in manure fractions following solids separation, as affected by time of storage	Robinson, Pos
Use of sewage sludge on agricultural land with emphasis on plant availability of heavy metals	Bates
Volatilization of ammonia from manure storage ponds	Robinson

LAND USE

The Ministry's agricultural development policies are informed by research results from the Agricultural Land Use programme. Scientists are developing criteria for identifying areas in the province that suit the production of specialty crops, thereby aiding the implementation of Foodland guidelines. A pilot project is identifying areas within a county in which soil erosion is more serious in terms of its effects on crop productivity and water quality. Generating comprehensive soil inventory information for growers and planners is an important goal of the programme.

Study of absentee landownership, phase III	Mage
Biophysical inputs for rural land use planning	Hilts
A land evaluation model for Ontario	Smit, Rodd, Phillips, Schildroth, Van Vuuren, Miller, Hilts, Brown, Mackintosh
Irrigation water use – Silver Creek Watershed, Elgin County	Ayers
Effect of land drainage on streamflow	Irwin, Whiteley, Serrano, Umpleby
Cost-benefit analysis of tile drainage	Van Vuuren
Impact of farm tenancy on agricultural land use	Van Vuuren
Ontario farm real estate prices	Gray, Prentice
Natural areas in the rural Ontario land use system	Moss, Milne
Interpretation of soil survey information for specialty crop production	Mackintosh
Remote sensing for soil survey, land use inventories and crop yield prediction in Southern Ontario	Protz
Soil criteria and class limits for soil classification	Protz
Micropedologic characterization of the major soil types in Ontario	Protz, Shipitalo
Assessment of the potential for increasing yields of field corn with irrigation	Brown
An assessment of the frequency and magnitude of wind erosion and its relationship to soil type and systems of agricultural production in Southern Ontario	Nickling
Analytical methods for rural land use monitoring in Ontario	Smit
Part-time use of the agricultural resource base in Ontario	Mage
Digital terrain analysis and mapping for erosion control and water management	Collins
Productivity profile of Ontario	Moss, Davis
Agricultural productivity in areas under urban influence	Van Vuuren

PEST MANAGEMENT AND DISEASE CONTROL

Insects destroy an estimated 15% of Ontario's agricultural production. Insecticides are an important part of control strategies, and the regular evaluation of insecticides and methods of application ensures that producers have the best chemical tools at hand. Integrated pest management (IPM) involves understanding the relationship between insect numbers and damage, and having monitoring programmes in place so that controls are applied only when needed, thereby saving growers money. At the same time, alternatives to chemical control are being sought. The biocontrol of insects is being studied as a main alternative to insecticide use to reduce costs and protect the environment.

Plant disease research aims at detecting disease, identifying causal agents, and developing control methodologies. Basic research is being conducted on how weather affects disease occurrence and spread, on the action of systemic pesticides, and on the development and persistence of soil borne and air borne strains of plant disease agents. Pesticide improvement, integrated disease control programmes, and data for breeding disease resistance are current goals of mission oriented research.

Without proper weed control tools, the advantages of progress in crop varieties and management are not fully exploited. The weed programme places high priority on fulfilling the weed control requirements of Ontario's food producers. Research is therefore directed to the development, evaluation, and integration of chemical and non chemical methods. As backup to this priority, research is conducted on the biology of weeds, the physiology of herbicides, and the interactions among weed control methods and the crop and non crop environment.

PROJECT TITLE	RESEARCHER
Evaluation of chemicals for brush control	Stephenson
Industrial oils and waxes from weeds	Alex, Rattray, Anderson
Pest diagnostic and advisory clinic	Kelly, Wukasch
Genetics, plant breeding and physiology of herbicide tolerance in plants	Souza Machado, Ali, Shupe
Competition among weed species and crop plants	Alex, Paine
Biology of perennial and annual weeds	Dekker, Anderson
To assess the interference effects of weeds on crop plants	Dekker, Anderson
Ecology of problem weeds	Alex, Paine
Surveys of weeds in Ontario	Alex
Biological control of weeds	Alex
Evaluation of new herbicides and combinations of herbicides for control of annual and perennial weeds in field crops	Anderson, Dekker
Weed control in established stands of alfalfa, birdsfoot trefoil and legume grass mixture	Anderson, Dekker
Biochemical effects of herbicides in plants	Fletcher
Mechanisms of herbicide action and selectivity	Stephenson, Pelly, Ezra
Weed control and growth retardation in turf	Switzer
Biology and control of the potato stem borer on field corn	Ellis, Beattie
Control experiments for pests of forage and field crops	Ellis, Beattie, Piedrahita
Threshold limits in pest control	Ellis, Beattie
Biology, ecology and control of the onion maggot	Madder

PROJECT TITLE	RESEARCHER
Insect control on potatoes	McEwen
Pesticides for minor crops	McEwen
Insect pests of turfgrass	Sears
Biology, ecology and control of the cabbage maggot	Sears
Control of arthropod parasites of livestock	Surgeoner
Fly control in barns and stables	Surgeoner
Fly control on cattle	Surgeoner
Biology of orchard insects	Laing, Heraty
Mechanisms of resistance in Ontario houseflies	Solomon, Valdes
Biology of pests on forage and cereal crops	Ellis, Beattie, Coote
Biosystematics of decay-related diptera	Marshall
Mushroom flies in Ontario	Marshall
Sex pheromone mediated biology and pheromone chemistry of noctuid pests of corn and tobacco	Teal
Assessment of insect growth regulators as blackfly control agents	Kaushik, Rodrigues
Distribution and biology of parasites of the alfalfa weevil	Ellis, Beattie
Growth and development in insects	Dixon, Schisler
Toxic interactions between pesticides in aquatic organisms	Solomon
Microbial pathogens of insects and their use in control	Laing, Bolter
A survey of disease problems of ornamental greenhouse plants and detailed studies of specific diseases	Busch
Development of white beans resistant to root rot	Hall

PROJECT TITLE	RESEARCHER
Verticillium wilt of economic plants	Busch, Robb
Virus disease of the commercial tomato crop	MacNeill, Menzies, Seaman
Bacterial speck of tomato	MacNeill, Lawton, Bonn, Bedford
Blister spot of Mutsu apple	MacNeill, Bedford
Fungal parasites of nematodes	Barron
Tomato bacterial canker	MacNeill, Dick
Diseases in muck grown vegetables	Sutton, Jesperson, Rowell, James
Epidemiology and integrated management of diseases in winter wheat	Sutton, Roke, Steele, James
Epidemiology and integrated management of diseases in spring barley	Sutton, James
Air pollutants and disease interaction in potato	Hofstra, Ford
Chemical and genetic control of corn diseases, especially head smut	Edgington, Fisher
Systemic fungicides – efficacy for control of cereal diseases	Edgington, Fisher
Systemic fungicides – efficacy for control of vegetable diseases	Edgington, Valdes, Oudemans, Louter
Mycotoxins in feed grains	Sutton, Busch, Procter, Attwater
Epidemiology and control of soybean white mold	Hall, Boland

ECONOMICS

Economics research includes two programmes: production, farm management and resources, and marketing, trade and policy. To help farmers evaluate their operations, computer models for hog farrow-to-finish farms and beef feedlots are being developed. Farm management work is generating a more precise method of classification of farms for use in management handbooks. Energy conservation technologies are being evaluated, as are the detrimental effects of some crop practices.

Market studies (particularly valuable to producers) include an examination of producer options to reduce risk and improve returns, such as the use of futures markets, contracting, and electronic auctions. Economists are developing models to assist in forecasting prices and to understand better the impact of policies. The potential for new crops, such as hybrid poplars, is being evaluated.

Participation in secondary planning for rural agricultural areas	Wolfe, Mowbray
Provision and consumption of public services in rural Ontario Implications of exurban development	Smit, Joseph, Poyner
Problems of rural youth	Pletsch, Blackburn, Hagarty
Social well-being of the recently retired	Martin-Matthews
Utilization of public services in rural areas	Joseph
Farmers' perceptions of problems and OMAF/U of G (OAC) extension and research	Blackburn, Pletsch, Young
Evaluation of the dairy feed formulation service	Blackburn
The economic welfare of recently retired rural households	Brown
Changing functions of rural settlements in Ontario's farming communities	Dahms
A planning model for beef production on farms with integrated cow-calf feedlot systems	Pfeiffer
Crossbreeding programs for beef production on a dairy farm	Burnside, Wilton, Pfeiffer, Rozzi
A simulation model for long range planning and expansion on swine farms	Pfeiffer, Pieper
Ontario dairy farm accounting project	Driver, Wright, Gulliver
An interregional competition study of the milk producing sector of the Ontario dairy industry	Driver
A survey of dairy product processing in Ontario	Pfeiffer
Development and application of a risk simulator	Driver
Agroeconomics of hybrid poplar in Eastern Ontario	Phillips, Pfeiffer
Energy utilisation in the Ontario agri-food system	Phillips
Seasonal employment in tobacco farming in Southwestern Ontario	Smit, Morse
Determination of farm management information for analyzing and planning representative dairy farms in Southwestern Ontario	Driver, Blackburn, Britney, Wright, Onwona
Predicting the changing size structure of Ontario dairy herds	Clark, Britney, McKinley
Operations management survey – Ontario agribusiness industry	Britney
A study of the debt carrying capacity of Ontario farms	Clark, Sarpong, Young
Economic analysis of alternative crop rotation systems for producing grain corn in Ontario	Stonehouse, Kay, Clark, Christofides, Baffoe

PROJECT TITLE	RESEARCHER
Financial management practices and skills of Ontario farmers	Blackburn
An economic analysis of seasonal inbalances in Canadian industrial milk shipments	Stonehouse, Burnside, Driver, Pfeiffer
Forecasting beef and hog prices	Martin, Henning
A price forecasting mechanism for the Canadian beef-pork sector	Martin, Henning
The use and development of econometric models for agricultural commodities	Meilke, Coleman, Miller, Moschini
Farm structure and performance in Canada	Brinkman
Evaluation of total factor productivity in Canadian agriculture	Brinkman
Evaluation of the productivity of Ontario agricultural research, phase II	Brinkman, Guindo
Identification and evaluation of market opportunities for Canadian manufacturers in the agricultural liquid handling equipment industry	Funk, Nuwame
Impact of genetic engineering on Canadian agriculture	Funk, Farrell
Segmentation of the market for agricultural inputs	Funk, Hudon
Economic potential of wild rice as a commercial crop in Northern Ontario	MacGregor
Supply management and quota values	MacGregor
Analysis of retail and processing margins for Canadian broilers	Martin
Evaluation of the productivity of Ontario agricultural research	Brinkman, Menzie, Prentice
Economics of broiler production in Ontario	MacGregor
Feasibility of an electronic auction for slaughter cattle in Ontario	Martin, Ceschi-Smith
Behaviour of Ontario dairy farmers in purchasing replacement animals and semen	Funk, Britney, Burnside
The development of a marketing strategy for Ontario rutabagas	Funk

ENGINEERING

Engineering research includes programmes in crop mechanization and farm buildings. Guelph's engineers are working to improve the equipment and methods used in crop production and alternate energy sources for field power units. Technology is being developed for bruise detection in apples, the esterification of canola oil, and high density packages for easier transport of hay. In search of new designs that will minimize soil erosion and energy consumption for primary tillage, engineers are studying the fundamental soil dynamics of tillage tools.

Current farm buildings studies focus on the pig environment. Work on heat exchangers for energy recovery is coupled with air distribution studies to maximize the exchangers' benefits. Solutions to the problems of icing and dust in commercial exchangers are also being sought. Floor type and stocking density as they relate to manure handling systems are being studied. Basic research is being done on the fundamentals of air-mixing in response to the thermal buoyancy forces at work in the livestock shelter.

Heat exchangers for swine buildings	Pattie, Ogilvie
Solar-assisted low-temperature corn drying and storage	Otten, Mittal, Brown
Evaluation of floor type and pig density	Ogilvie, Pattie
Solar heating of farm buildings	Otten, Mittal, Brown
Energy efficient building systems	Jofriet
Vegetable oils as fuels for diesel engines	Southwell
Influence of soil tools on the physical properties of fine textured Ontario soils	Lee, Nwokedi, Ilyas, Ketcheson
Energy accounting	Southwell
Evaluation of the formation, storage, handling and feeding of large hay bales	Bilanski, Winch, Mowat
High-density packaging of forages for on-farm feeding or for cash-crop sale	Bilanski, Winch, Stone
Energy self-sufficient farm systems	Southwell
Peanut harvesting and curing	Tanner, White, Bilanski, Roy

FOOD AND FOOD QUALITY

Guelph's food research programme seeks to increase the year-round availability of wholesome and high quality Ontario-grown food to Canadian consumers and export markets. To do this, the changes in the chemical and physical composition of raw materials during processing and storage are being studied. Better objective methods to evaluate food quality are being sought. Work is underway to improve the recovery of by-products from food processing waste streams, such as solids from potato and tomato processing, and to use these materials in existing and novel food products.

PROJECT TITLE	RESEARCHER
Assessment of food grades in relation to their usefulness to consumers	Gullett, Rowe
Fat content of chicken broilers in relation to grade and consumer acceptability	Gullett, Rowe
The role of nitrites in meat presrvation	Collins-Thompson
Toxicity of processed and heated fats	Alexander, Gabriel, Wilson
Long term effects of dietary trans fatty acids	Walker, Mulvihill
Microprocessor control in fermentation	Meiering
Process control in pilot scale wine fermentation	Meiering, Fyfe, Cunningham, Subden
Hydrogenation of canola oil	DeMan, Blackman
Quality of dairy products	DeMan, Blackman
Metabolic activities of psychrophilic bacteria and incidence of opportunistic microorganisms in relation to the quality of dairy and food products	Cunningham, Saunders
Antimicrobial agents for lactic acid bacteria as a possible replacement for nitrite in cured meats	Collins-Thompson
Controlled atmosphere (CA) storage of apples	Lougheed, Murr, Proctor
Controlled atmosphere storage of vegetables	Lougheed, Murr
Microbial utilization of liquid agricultural and industrial carbohydrate wastes from the food and fermentation industries	Cunningham, Wright
Isolation and identification of the lactic acid bacteria from yogurt cultures	Duitschaever, Van Esch
Microorganisms as potential food sources (single cell protein) for human food supplementation	Cunningham, Simpson
Quality testing of Canada soft wheats with chopin alveograph	Rasper, Hardy
An investigation of the major factors influencing beef tenderness	Stanley, Jones
Measurement of the surface colour of tomatoes using fiber optics	Stanley
Thermoduric psychrotrophic bacteria in milk and their effect on keeping quality	Myhr, Smith
Chemical, physical and functional properties of canola lecithins	Kakuda

PROJECT TITLE	RESEARCHER
Moisture mobility, product quality and functionality of meat emulsions due to binders, extenders, and meats	Mittal, Usborne
Characterization and nutritional assessment of oilseeds and processed vegetable oils from newly-developed varieties of Ontario canola	Holub
The role of water soluble pentosans in the process of soft wheat flour chlorination	Rasper
Control of late gas blowing in cheddar cheese	Myhr, Irvine, Wallace
The coagulation and separation of the whey protein albumin from cheese whey. The manufacture of these whey proteins into a nutritious food product	Irvine, Bullock, Hill
Effect of nitrite and salt on palatability of ham	Gullett
Biological effects of malonaldehyde	Draper, McGirr, Piche, Valli, Hadley
Collaborative study in evaluation of protein quality	Smith
Egg quality studies	Hunt, Orr, McEwan, Ewan, Ferguson, Epps, McQuay, Evans
Effect of microwave vs conventional cooking on the palatability and nutritive value of broccoli and carrots	Gullett
Effect of excess dietary protein and phosphorus on the homeostasis of adult bone	Draper, Yuen
Agricultural by-products as unconventional sources of dietary fiber	Rasper
Vitamin A stability in UHT processed milk	Kakuda
Studies on the nitrosation of phenols in wood smoke	Kakuda
Unsaturated monoglycerides as replacement for polysorbate 80 in frozen desserts	Pearson
Edulcoration of white wine with a sweetener that is not susceptible to microbial catabolism	Duitschaever, Smiles, Ashton
The presence and significance of biogenic amines in Canadian wines	Duitschaever, Buteau
Assessment of safe levels of environmental contaminants in foods	Holub

PROJECT TITLE	RESEARCHER
Infrared reflectance	Van de Voort
Thermal processing	Van de Voort

PROJECT TITLE	RESEARCHER
Vinification of red grapes by carbonic maceration	Duitschaever, Ashton

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